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For related information see also *Astronautics*.

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88 SPACE SCIENCES (GENERAL) 1802

89 ASTRONOMY 1807
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1808
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1810
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1810
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1811
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1811

Note: N.A. means that no abstracts were assigned to this category for this issue.

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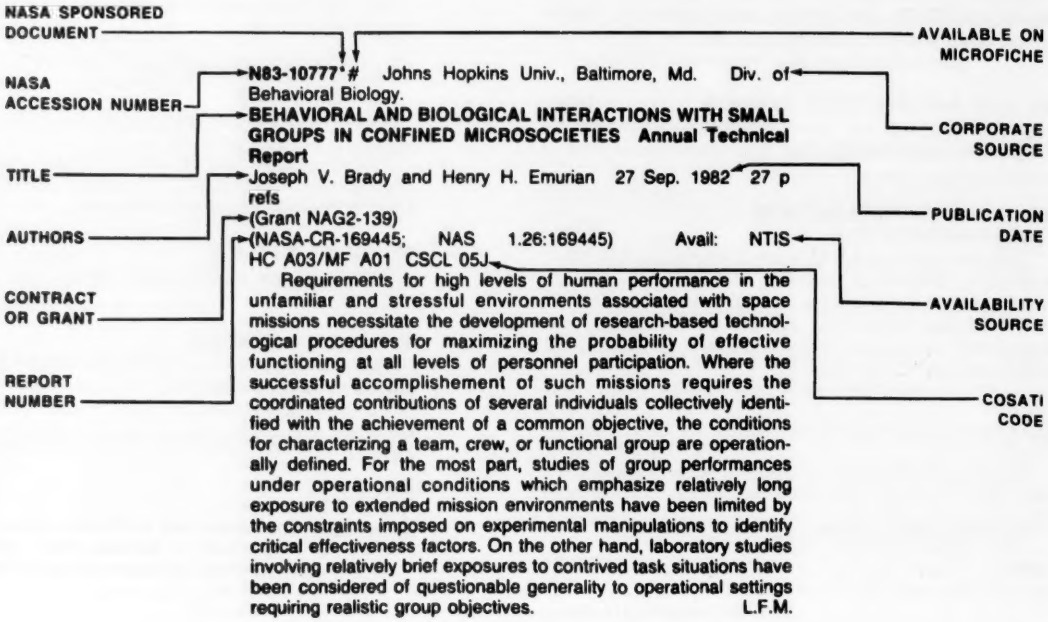
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N83-10777*# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
PUBLICATION DATE
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(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
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COSATI CODE
Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 11/JUNE 8, 1983

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N83-20894# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
UNSTEADY AIRLOADS AND AEROELASTIC PROBLEMS IN SEPARATED AND TRANSONIC FLOW
1981 341 p refs Lecture held in Rhode-Saint-Genese, Belgium, 9-13 Mar. 1981
(VKI-LS-1981-4) Avail: NTIS HC A15/MF A01

Papers from a lecture series on unsteady airloads and aeroelastic problems in separated and transonic flow are presented. For individual titles, see N83-20895 through N83-20906.

N83-20895# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
INTRODUCTORY SURVEY OF AEROELASTIC PROBLEMS IN SEPARATED AND TRANSONIC FLOW c02
H. Foersching *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 26 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

A survey of aeroelastic problems in separated and transonic flow is presented. The problems of aircraft dynamic stalling and buffeting, and on the aeroelastic problems peculiar to transonic flow are emphasized. The effects of these aeroelastic phenomena on aircraft design are discussed and illuminated through representative examples. E.A.K.

N83-20896*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PHENOMENON OF DYNAMIC STALL c02
W. J. McCroskey *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 28 p refs Original document was announced as N81-20029 (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01 CSCL 01A

Dynamic stall and its consequences which are important to aircraft design and operation are discussed. A certain degree of unsteadyness always accompanies the flow over streamlined bodies at high angle of attack, however, the stall of lifting surface undergoing unsteady motion is more complex than static stall. Dynamic stall remains a major unsolved problem with a variety of applications in aeronautics, hydrodynamics and wind engineering. E.A.K.

N83-20897# Royal Aircraft Establishment, Farnborough (England).
DYNAMIC RESPONSE OF AIRCRAFT WITH FLUCTUATING FLOW FIELDS c08
J. G. Jones *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 24 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

The mathematical models of motions in terms of the coupled system involving the aerodynamic flow field and the aircraft dynamic response to aerodynamic forces are outlined. The systems have two types of behavior which are determined by the magnitude of a controlling parameter which influences stability. For a finite range or parameter values the system is stable and its structure is described by a deterministic set of differential equations. At the critical value of the parameter, however, the system becomes unstable and beyond this boundary no longer achieves a state of equilibrium but may exist in a state typified by continuous fluctuations. This state may be either a regular limit cycle type of oscillation or may be random in nature. E.A.K.

N83-20898# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
AEROELASTIC BUFFETING PREDICTION TECHNIQUE. A GENERAL REVIEW c08
H. Foersching *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 49 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

Analytical techniques for the prediction of the aeroelastic buffeting behavior of flexible aircraft are described. The basic characteristics of separated flow unsteady airloads as they relate to the aeroelastic buffet problem are outlined. The problem of formulating appropriately the various types of regular or irregular buffeting oscillations is treated, and the corresponding mathematical/physical models are reviewed. The problem of acquisition and conversion of wind tunnel model data to form full scale generalized aerodynamic buffet forcing functions and motion induced airload terms is discussed. E.A.K.

N83-20899# Royal Aircraft Establishment, Bedford (England).
SOME REMARKS ON BUFFETING c08
D. G. Mabey *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 15 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

Buffeting which is the structural response to the aerodynamic excitation produced by separated flow is discussed. Buffet onset is often defined as the first appearance of a significant area of separated flow. The term buffeting was first introduced when a structural failure occurred to the tail of a Junkers monoplane in 1930. This failure was attributed to buffeting of the tailplane excited by flow separations on the wing. The flow separations on the wing were caused by an encounter with a severe gust which was attributed to the structural failure of the wing caused by the gust. It is emphasized that buffeting often occurs in critical flight situations, when limit loads are approached or when the aircraft is approaching lateral or longitudinal stability boundaries. E.A.K.

N83-20900# Royal Aircraft Establishment, Farnborough (England).
SOME COMPARISONS OF RECENT FLIGHT AND TUNNEL BUFFETING MEASUREMENTS c02
G. F. Butler and J. G. Jones *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 30 p refs (For primary document see

N83-20894 11-01)
Avail: NTIS HC A15/MF A01

A simple buffeting prediction technique which involves the measurement of the response of models of conventional solid metal construction and compares predictions with flight test results is outlined. E.A.K.

N83-20901# Nielsen Engineering and Research, Inc., Mountain View, Calif.
PREDICTION OF AEROELASTIC AND UNSTEADY AERODYNAMIC PHENOMENA IN TRANSONIC FLOW c02
David Nixon *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 78 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

The state of the art of transonic prediction methods from two viewpoints, where the accuracy is dominant and where cost is dominant with some acceptable loss in accuracy is summarized. The ability of results obtained from each viewpoint to incorporate structural dynamic models is also discussed. Remaining problems of transonic prediction methods and possible future developments are outlined. E.A.K.

N83-20902# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
UNSTEADY AERODYNAMIC AND AEROELASTIC PROPERTIES ON CONTROL SURFACES IN TRANSONIC FLOW c02
N. C. Lambourne *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 15 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

The steady and unsteady aerodynamic properties of control surfaces are reviewed. The aerodynamic properties provide a background to understand the aeroelastic problems that affect controls in the transonic regime. Simple trailing edge control surfaces representing flaps, wings or airfoils are discussed. Flow regimes are described and the physical properties are emphasized. E.A.K.

N83-20903# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
COMPARISON OF COMPUTED AND MEASURED UNSTEADY PRESSURE FIELDS OF A SUPERCRITICAL WING c02
M. Couston, J. J. Angelini, and J. L. Meurzec *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 28 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

The prediction of unsteady flows over supercritical wings of modern transport aircrafts is discussed. The unsteady aerodynamic loads acting on the structure were studied. A provisional approach, based on asymptotic approximation for wings with large aspect ration and small sweepback, which allows the introduction of a three dimensional correction into the nonlinear, two dimensional calculation is proposed. The experimental and nonlinear two dimensional and approximate three dimensional calculations are compared. E.A.K.

N83-20904# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Fluid Dynamics Div.
AEROELASTIC PROBLEMS OF WINGS IN TRANSONIC FLOW c02
R. J. Zwaan *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 50 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

Transonic flutter characteristics of wings are discussed. The transonic dip in the flutter boundary are emphasized. The phenomenon is examined with 2-D wings as examples. Experimental work and prediction methods dealing with transonic flutter characteristics of 3-D wings are surveyed. E.A.K.

N83-20905# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
WIND TUNNEL WALL INTERFERENCE IN UNSTEADY TRANSONIC TESTING c09
N. C. Lambourne *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 17 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

The sources of wind tunnel interference are identified and particular attention being given to those affecting unsteady transonic measurements. The results of comparative measurements in different transonic tunnels are described and their implications regarding the avoidance of large interference effects are discussed. E.A.K.

N83-20906# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
UNSTEADY AIRLOADS ON OSCILLATING WINGS IN POST-STALL CONDITION c02
P. Bublitz *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 30 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

Wind tunnel tests were performed on two wing configurations. The first one is a basic trapezoidal half wing model, and the second one is the same basic wing equipped with a strake. The tests were executed under incompressible flow conditions in the low speed wind tunnel. The test installations are described and test results are discussed, especially with respect to the aeroelastic/dynamic response problem and the aeroelastic stability problem. E.A.K.

N83-20907# Air Force Logistics Command, Wright-Patterson AFB, Ohio. Logistics Systems Laboratory Div.
F100 ENGINE BUILD POLICY FINDINGS Final Report
Virginia L. Williamson Nov. 1982 23 p
(AD-A122868; XRS-82-217A) Avail: NTIS HC A02/MF A01 CSCL 15/5

The build policy study was pursued as a follow on study to the OMENS (Opportunistic Maintenance Engine Simulator) work. The engine studied is the F100 engine used in the F-15 aircraft. The OMENS model assumes that whenever a worn or used part is replaced, it is replaced with a new part. Some life limited parts, however, have had life limits extended, been refurbished or salvage, and are still useable. The part from a pool of used parts which would be the most cost effective to install, given no new parts are available is determined. Removal rates, NRTS rates, and all available costs studied in OMENS are considered. GRA

N83-20908# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A QUALITATIVE ANALYSIS OF SAC AIRCRAFT MAINTENANCE M.S. Thesis
Douglas P. Cook and Harry J. Devault Sep. 1982 124 p refs (AD-A122815; AFIT-LSSR-17-82) Avail: NTIS HC A06/MF A01 CSCL 15/5

Past research efforts in SAC aircraft maintenance have addressed singular issues. Little attention has been given to examine the holistic environment that encompasses SAC aircraft maintenance. The purpose of this study was to examine and identify problems within the SAC aircraft environment from the perspective of its personnel. From interview data obtained from the Air Force Human Resources Laboratory, WPAFB OH, it was found that the SAC aircraft maintenance environment could be categorized as follows: Methods Support, Work Environment, Equipment Support, Personnel Policy, Motivation/Morale, and Technical Support. Further, it was found that the above-mentioned categories could be divided into unique areas for specific analysis. The data revealed that every area and category could be prioritized by the percentage of negative statements within each area and category. A negative statement indicated that a problem existed in a given area and category. The authors found that all areas and categories contained a highly significant number of problems. Finally, a suggested format was offered by the authors to help SAC units to identify problems within their respective units. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N83-20909# Oxford Univ. (England). Dept. of Engineering.
A WIND TUNNEL SIMULATION OF THE WIND IN AN URBAN ENVIRONMENT
K. W. Rutledge Jul. 1982 22 p refs
(OUEL-1414/82) Avail: NTIS HC A02/MF A01

A part depth simulation of an urban flow is described. The velocity characteristics of the resulting simulation is investigated. The tunnel design and the experimental techniques employed are described. S.L.

N83-20910# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
AN EXPERIMENTAL INVESTIGATION OF A HYPERSONIC TURBULENT BOUNDARY LAYER ON A COLD CONE SURFACE
Lin Zhen Bin (Acad. Sinica, Peking) and J. K. Harvey May 1982 61 p refs
(Contract AT/2037/084)
(IC-Aero-82-01; ISSN-0308-7247) Avail: NTIS HC A04/MF A01

Average flow properties inferred from pitot pressure profiles and surface measurements of heat transfer, skin friction and static pressure were obtained for a naturally turbulent boundary layer on a cold sharp cone of 5 deg semi-vertex angle at a Mach number of 9.26. Other properties such as Reynolds analogy factor, enthalpy defect thickness, compressibility transformed velocity profiles, mixing length and eddy viscosity profiles were obtained after using the Crocco relationship. Comparisons are made with several laws applicable to low Mach number zero pressure gradient flows. The conclusion is drawn that the turbulent boundary layer under these hypersonic conditions is not significantly different from the low Mach number case providing the mean density gradient is taken into account in the laws. Author

N83-20911*# Grumman Aerospace Corp., Bethpage, N.Y.
NODAL NETWORK GENERATOR FOR CAVE3
Joseph V. Palmieri and Kenneth A. Rathjen Dec. 1982 61 p ref
(Contract NAS1-15367)
(NASA-CR-165860; NAS 1.26:165860) Avail: NTIS HC A04/MF A01 CSCL 01A

A new extension of CAVE3 code was developed that automates the creation of a finite difference math model in digital form ready for input to the CAVE3 code. The new software, Nodal Network Generator, is broken into two segments. One segment generates the model geometry using a Tektronix Tablet Digitizer and the other generates the actual finite difference model and allows for graphic verification using Tektronix 4014 Graphic Scope. Use of the Nodal Network Generator is described. Author

N83-20912*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRFOIL SHAPE AND THICKNESS EFFECTS ON TRANSONIC AIRLOADS AND FLUTTER
Samuel R. Bland and John W. Edwards Mar. 1983 10 p refs Presented at the AIAA/ASME/ASCE/AHS 24th Struct., Struct. Dyn. and Mater. Conf., Lake Tahoe, Nev. 2-4 May 1983
(NASA-TM-84632; NAS 1.15:84632) Avail: NTIS HC A02/MF A01 CSCL 01A

A transient pulse technique is used to obtain harmonic forces from a time-marching solution of the complete unsteady transonic small perturbation potential equation. The unsteady pressures and forces acting on a model of the NACA 64A010 conventional airfoil and the MBB A-3 supercritical airfoil over a range of Mach numbers are examined in detail. Flutter calculations at constant angle of attack show a similar flutter behavior for both airfoils, except for a boundary shift in Mach number associated with corresponding Mach number shift in the unsteady aerodynamic forces. Differences in the static aeroelastic twist behavior for the two airfoils are significant. Author

N83-20913*# Princeton Univ., N. J. Gas Dynamics Lab.
AN EXPERIMENTAL STUDY OF THREE-DIMENSIONAL SHOCK WAVE/BOUNDARY LAYER INTERACTIONS GENERATED BY SHARP FINS Annual Status Report, 1 Apr. 1982 - 31 Mar. 1983
Frank K. Lu, Gary S. Settles, and Seymour M. Bogdonoff Mar. 1983 165 p refs
(Grant NAG2-109)
(NASA-CR-170107; NAS 1.26:170107; MAE-1584-T) Avail: NTIS HC A07/MF A01 CSCL 01A

The interaction between a turbulent boundary layer and a shock wave generated by a sharp fin with leading edge sweepback was investigated. The incoming flow was at Mach 2.96 and at a unit Reynolds number of 63 x 10 to the 6th power 0.1 m. The approximate incoming boundary layer thickness was either 4 mm or 17 mm. The fins used were at 5 deg, 9 deg and 15 deg incidence and had leading edge sweepback from 0 deg to 65 deg. The tests consisted of surface kerosene lampblack streak visualization, surface pressure measurements, shock wave shape determination by shadowgraphs, and localized vapor screen visualization. The upstream influence lengths of the fin interactions were correlated using viscous and inviscid flow parameters. The parameters affecting the surface features close to the fin and way from the fin were also identified. Essentially, the surface features in the farfield were found to be conical. S.L.

N83-20914*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TRANSONIC PRESSURE DISTRIBUTIONS ON A RECTANGULAR SUPERCRITICAL WING OSCILLATING IN PITCH
Rodney H. Ricketts, Maynard C. Sandford, David A. Seidel, and Judith J. Watson Mar. 1983 12 p refs Presented at 24th AIAA/ASME/ASCE/AHS Struct., Struct. Dyn. and Mater. Conf., Lake Tahoe, Nev., 2-4 May 1983
(NASA-TM-84616; NAS 1.15:84616; AIAA-Paper-83-0923) Avail: NTIS HC A02/MF A01 CSCL 01A

Steady and unsteady aerodynamic data were measured on a rectangular wing with a 12 percent thick supercritical airfoil mounted in the NASA Langley Transonic Dynamics Tunnel. The wing was oscillated in pitch to generate the unsteady aerodynamic data. The purpose of the wind-tunnel test was to measure data for use in the development and assessment of transonic analytical codes. The effects on the wing pressure distributions of Mach number, mean angle of attack, and oscillation frequency and amplitude were measured. Results from the newly-developed XTRAN3S program (a non-linear transonic small disturbance code) and from the RHOIV program (a linear lifting surface kernel function code) were compared to measured data for a Mach number of 0.7 and for oscillation frequencies ranging from 0 to 20 Hz. The XTRAN3S steady and unsteady results agreed fairly well with the measured data. The RHOIV unsteady-result agreement was fair but, of course, did not predict shock effects. Author

N83-20915*# National Aeronautics and Space Administration, Washington, D. C.
SOME CHARACTERISTIC QUANTITIES OF KARMAN-TREFFTZ PROFILES
J. J. H. Blom Jan. 1983 35 p refs Transl. into ENGLISH of "Enige Karateristieke Grootheden Van Von Karman-Trefftz Profielen" rept. VTH-LR-323 Technische Hogeschool, Delft, Netherlands, Jun. 1981 40 p Original language document was announced as N82-19189 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77013; NAS 1.15:77013) Avail: NTIS HC A03/MF A01 CSCL 01A

For von Karman-Trefftz profiles, the characteristics which determine profile shape (profile nose dimensions, maximum thickness and position: tail slope and curvature) are stated as a

function of transformation variables using the Timman method. The profile is obtained by iterative deformation of a von Karman profile with known transformation, corresponding as well as possible to the desired profile. The figures and relations which enable a good choice of the required profile are given. Author (ESA)

N83-20916*# National Aeronautics and Space Administration, Washington, D. C.

A STUDY OF DIRIGIBLES FOR USE IN THE PERUVIAN SELVA CENTRAL REGION

Norman J. Mayer Mar. 1982 144 p refs
(NASA-TM-85633; NAS 1.15:85633) Avail: NTIS HC A07/MF A01 CSCL 01C

The potential for dirigibles as transports in the Selva Central region of Peru was evaluated by means of a mission and economic analysis. A total requirement to transport over 19 million tons (t) of agricultural produce, lumber, and meat was projected by the year 2004. A primary route involving zones for loading and delivering this cargo was identified. Although dirigibles are capable of short field operation, all existing airfields must be enlarged in width to allow for all conditions of wind and weather and to provide space for overnight mooring. A maintenance base and operations headquarters, complete with hangar and other service facilities would be required. The quantities of cargo to be carried establish requirements for fleets of dirigibles of various sizes and capacities. Cargo capacities of 5 to 100 tons were identified. Fleet sizes up to 106 dirigibles (in 20 t capacities) would be required. Dirigibles were assumed to be of the nonrigid type except in the 100 t category for which rigid characteristics were assumed. A method of determining dirigible costs was developed. The values derived were then applied to an economic analysis to determine initial investment and operating costs. It was found that larger dirigibles of approximately 20 t capacities or higher could offer significant cost benefits over airplanes, provided cruise speeds were higher than 100 km/hr. M.G.

N83-20917*# National Aeronautics and Space Administration, Washington, D. C.

A STUDY OF DIRIGIBLES FOR USE IN THE PERUVIAN SELVA CENTRAL REGION [ESTUDIO DE DIRGIBLES PARA UTILIZACION EN LA REGION DE LA SELVA CENTRAL DEL PERU]

Norman J. Mayer Mar. 1982 150 p refs In SPANISH
(NASA-TM-85634; NAS 1.15:85634) Avail: NTIS HC A07/MF A01 CSCL 01C

The potential for dirigibles as transports in the Selva Central region of Peru was evaluated by means of a mission and economic analysis. A total requirement to transport over 19 million tons (t) of agricultural produce, lumber and meat was projected by the year 2004. A primary route involving zones for loading and delivering this carbo was identified. Although dirigibles are capable of short field operation, all existing airfields must be enlarged in width to allow for all conditions of wind and weather and to provide space for overnight mooring. A maintenance base and operations headquarters, complete with hangar and other service facilities would be required. The quantities of cargo capacities of 5 to 100 tons were identified. Fleet sizes up to 106 dirigibles (in 20 t capacities) would be required. Dirigibles were assumed to be of the nonrigid type except in the 100 t category for which rigid characteristics were assumed. A method of determining dirigible costs was developed. The values derived were then applied to an economic analysis to determine initial investment and operating costs. It was found that larger dirigibles of approximately 20 t capacities or higher could offer significant cost benefits over airplanes, provided cruise speeds were higher than 100km/hr. M.G.

N83-20918*# Bihrle Applied Research, Inc., Jericho, N. Y.

ROTARY BALANCE DATA FOR A TYPICAL SINGLE-ENGINE GENERAL AVIATION DESIGN FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG. 1: INFLUENCE OF AIRPLANE COMPONENTS FOR MODEL D

John Ralston Washington NASA Mar. 1983 316 p refs
(Contract NAS1-16205)
(NASA-CR-3246; NAS 1.26:3246) Avail: NTIS HC A14/MF A01 CSCL 01A

The influence of airplane components, as well as wing location and tail length, on the rotational flow aerodynamics is discussed for a 1/6 scale general aviation airplane model. The airplane was tested in a built-up fashion (i.e., body, body-wing, body-wing-vertical, etc.) in the presence of two wing locations and two body lengths. Data were measured, using a rotary balance, over an angle-of-attack range of 8 deg to 90 deg, and for clockwise and counter-clockwise rotations covering an omega b/2V range of 0 to 0.9. Author

N83-20919# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Entwurfsaerodynamik.

EVALUATION OF BOUNDARY LAYER MEASUREMENTS IN TWO-DIMENSIONAL COMPRESSIBLE SUBSONIC FLOW WITH PRESSURE GRADIENT ACROSS THE BOUNDARY LAYER

Reinhard Kiock Jun. 1982 27 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-810)
(DFVLR-Mitt-82-14; ESA-TT-810) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 12,70

If the flow along a highly curved wall is decelerated, thick boundary layers occur with strongly changing static pressures. This pressure gradient influences the kind of the evalution of the boundary layer measurement, i.e., the determination of the displacement thickness, the momentum thickness, and the shape factor to a large entent. These parameters are defined in different ways and the results from an arbitrarily chosen example are compared. Author

N83-20920# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

MEASUREMENT OF THE FLOW-FIELD BEHIND HARMONICALLY OSCILLATING GUST GENERATORS IN THE MODEL SUBSONIC WIND TUNNEL (MUK)

Bernd Krag Aug. 1982 146 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-806)
(DFVLR-FB-82-26; ESA-TT-806) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 46,20

The German Netherland wind tunnel (DNW) considers the installation of a gust generator. Basic investigations in the model subsonic wind tunnel shows which parameters are influencing the propagation of the gust field and which type of gust generator is best suited for the DNW. Four different types of gust generators were investigated. The gust field was measured within the complete volume of the test section using dynamic flow direction probes. S.L.

N83-20921# Aeronautical Research Associates of Princeton, Inc., N. J.

VISCOUS THEORY OF LIFT ON BODIES OF REVOLUTION Final Report, 1 Feb. 1981 - 31 Jan. 1982

John E. Yates Feb. 1982 45 p refs
(Contract N00014-81-C-0240)
(AD-A122549; ARAP-464) Avail: NTIS HC A03/MF A01 CSCL 01/3

The viscous theory of unsteady lift on bodies of revolution is developed. The exact potential theory is derived and reduced to an integral equation for an unknown load function in terms of a generalized upwash function. The integral is formally the same as two-dimensional wing theory and the viscous modification of the kernel function is based on the principles of wing theory and detailed analysis of a ring-wing. Numerical results are presented for the ring-wing in steady flow that are in agreement with the predictions of slender body theory for small diameter to length ratios. Asymptotic results for very large diameter to length ratios are in exact agreement with previsously reported theoretical results and approximate agreement with experiment. GRA

N83-20922# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA MECHANICA (SELECTED ARTICLES)
22 Nov. 1982 25 p refs Transl. into ENGLISH from Lixue Xuebau (China), no. 2, 1980 p 120-128 and 199-203
(AD-A122810; FTD-ID(RS)T-0978-82) Avail: NTIS HC A02/MF A01 CSCL 20/4

The reference enthalpy method in boundary layer theory is extended to the two dimensional and axisymmetrical three dimensional flow with pressure gradient. The formulae for calculating the momentum thickness and friction coefficient along the body surface are obtained. The approximate relationships among various thicknesses are derived by using some related results of the boundary layer theory. The nonlinear small perturbation potential equation at transonic speed based on critical sound speed is transformed into integral form in the zeta-x plane normal to incoming flow. The relationship between the perturbation velocity field (sidewash, downwash) behind thin wings and the velocity field induced by elemented vortices was established. GRA

N83-20923# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SURVEY OF TRANSONIC FLOW RESEARCH IN CHINA
Zhichu Zheng 18 Oct. 1982 9 p Transl. into ENGLISH from Lixue yu Shijian (China), v. 4, no. 1, 1982 p 70-71
(AD-A122788; FTD-ID(RS)T-1077-82) Avail: NTIS HC A02/MF A01 CSCL 20/4

Transonic flow research is surveyed. Calculations for steady state, inviscid external flow; nonstationary external flow; and internal flow are discussed. The finite difference method is used for the calculation of transonic flow fields for airfoils, bodies of rotation, intake ducts, cascades, and entire fuselages. S.L.

N83-20924# City Univ., London (England). Dept. of Aeronautics.
ANALYSIS OF TRANSONIC WINDTUNNEL FLOWS: BOUNDARY CONDITIONS FOR PERFORATED WALL WINDTUNNEL FLOWS Final Scientific Report, 1 Jan. - 31 Aug. 1982
M. M. Freestone and P. Henington 22 Oct. 1982 34 p refs (Grant AF-AFOSR-0129-82; AF Proj. 2301)
(AD-A122799; AERO-82/2; EOARD-TR-83-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

A scheme for obtaining an improved boundary condition relevant to the perforated walls of transonic wind tunnel is reviewed and the sources of possible errors involved in its practical application are assessed. Earlier work by the authors to implement the scheme provided measured boundary layer development and flow directions just outside the boundary layer in The City University transonic wind tunnel. This work is shown to have been subject to errors from two main sources. First the yawmeter calibrations were not sufficiently accurate, and the remedy for this is presented. Second, lateral nonuniformity was present which produced significant flow angle variations. This nonuniformity is shown to be much reduced by wind tunnel alterations, possibly the most important of these being an increase of the open-area ratio of the antiturbulence screens. GRA

N83-20895# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
INTRODUCTORY SURVEY OF AEROELASTIC PROBLEMS IN SEPARATED AND TRANSONIC FLOW
H. Foersching *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 26 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20896*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE PHENOMENON OF DYNAMIC STALL
W. J. McCroskey *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 28 p refs Original document was announced as N81-20029 (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01 CSCL 01A

N83-20900# Royal Aircraft Establishment, Farnborough (England).
SOME COMPARISONS OF RECENT FLIGHT AND TUNNEL BUFFETING MEASUREMENTS
G. F. Butler and J. G. Jones *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 30 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20901# Nielsen Engineering and Research, Inc., Mountain View, Calif.
PREDICTION OF AEROELASTIC AND UNSTEADY AERODYNAMIC PHENOMENA IN TRANSONIC FLOW
David Nixon *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 78 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20902# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
UNSTEADY AERODYNAMIC AND AEROELASTIC PROPERTIES ON CONTROL SURFACES IN TRANSONIC FLOW
N. C. Lambourne *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 15 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20903# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
COMPARISON OF COMPUTED AND MEASURED UNSTEADY PRESSURE FIELDS OF A SUPERCRITICAL WING
M. Couston, J. J. Angelini, and J. L. Meurzec *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 28 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20904# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium). Fluid Dynamics Div.
AEROELASTIC PROBLEMS OF WINGS IN TRANSONIC FLOW
R. J. Zwaan *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 50 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20906# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
UNSTEADY AIRLOADS ON OSCILLATING WINGS IN POST-STALL CONDITION
P. Bublitz *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 30 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N83-20925# Committee on Commerce, Science, and Transportation (U. S. Senate).
AIRLINER CABIN SAFETY AND HEALTH STANDARDS
Washington GPO 1982 170 p refs Hearing on S. 1770 before the Subcomm. on Aviation of the Comm. on Com., Sci. and Transportation, 97th Congr., 2d Sess., 20 May 1982
(GPO-95-930) Avail: Subcommittee on Aviation

Review of the adequacy of industrial practices and FAA rules and regulations which set the minimum standard for air quality on

commercial aircraft was conducted. Special emphasis was placed on two issues: health and safety of the crew and passengers.
B.G.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N83-20926*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
RELIABILITY ANALYSIS AND FAULT-TOLERANT SYSTEM DEVELOPMENT FOR A REDUNDANT STRAPDOWN INERTIAL MEASUREMENT UNIT Final Report
P. Motyka Mar. 1983 70 p refs
(Contract NAS1-16887)
(NASA-CR-166050; NAS 1.26:166050; CSDL-R-1588) Avail: NTIS HC A04/MF A01 CSCL 17G

A methodology is developed and applied for quantitatively analyzing the reliability of a dual, fail-operational redundant strapdown inertial measurement unit (RSDIMU). A Markov evaluation model is defined in terms of the operational states of the RSDIMU to predict system reliability. A 27 state model is defined based upon a candidate redundancy management system which can detect and isolate a spectrum of failure magnitudes. The results of parametric studies are presented which show the effect on reliability of the gyro failure rate, both the gyro and accelerometer failure rates together, false alarms, probability of failure detection, probability of failure isolation, and probability of damage effects and mission time. A technique is developed and evaluated for generating dynamic thresholds for detecting and isolating failures of the dual, separated IMU. Special emphasis is given to the detection of multiple, nonconcurrent failures. Digital simulation time histories are presented which show the thresholds obtained and their effectiveness in detecting and isolating sensor failures.
Author

N83-20927# Bendix Corp., Baltimore, Md. Communications Div.
FRANGIBLE MICROWAVE LANDING SYSTEM (INVERTED AZIMUTH WAVEGUIDE ARRAY CONFIGURATION) Final Report
P. D. Wienhold and E. F. Kolb Washington FAA Dec. 1982 82 p
(Contract DTFA01-81-C-10068)
(DOT/FAA/RD-82/88; BCD-FR-82-002) Avail: NTIS HC A05/MF A01

A feasibility study of the increased frangibility of Microwave Landing System equipment mounted on the extended runway centerline and an assessment of the FAA requirements in regard to frangibility was presented. A conceptual design known as the inverted AZ array was developed and fabricated as a mechanical prototype. The primary structural components of the antenna are vertical cantilever waveguides and frangible joints incorporated into their base. Impact and static load tests proved that several joint designs meet the FAA requirements for frangibility. B.G.

N83-20928# Coast Guard, Washington, D.C. Office of Research and Development.
LORAN-C SIGNAL STABILITY STUDY: SAINT LAWRENCE SEAWAY Final Interim Report, Aug. 1981 - Jun. 1982
D. C. Slagle and R. J. Wenzel Jul. 1982 218 p refs
(AD-A122476; USCG-D-39-82) Avail: NTIS HC A10/MF A01 CSCL 17/7

Since 1977, the U.S. Coast Guard has been conducting studies of the suitability of Loran-C as a precision aid to navigation in the harbor-harbor entrance (HHE) areas of the continental U.S. The final phase of this effort involves an assessment of the stability of the signals of the existing Loran-C system along with an examination of stability improvement methods. The final efforts were begun early in 1981 with the deployment of Loran data collection sets (the so-called harbor monitors) in select harbor areas. In cooperation with the St. Lawrence Seaway Development Corporation, St. Lawrence Seaway Authority and the Canadian Coast Guard, these efforts were extended to the St. Lawrence Seaway area in late 1981. Resulting data is analyzed in the report and indicates the performance of the existing Loran-C system is inadequate to support precision applications in the St. Lawrence. The performance of Differential Loran-C is hypothesized and found to be, at best, marginal due to suboptimal system geometry. The performance which would result with the addition of another transmitting station is also hypothesized. With this improved geometry, raw Loran-C performance is still found inadequate but Differential Loran-C yielding maximum cross-track errors of 27 meters (99.9% probability), leaves 23 meters error margin for the largest vessels. GRA

N83-20929# Naval Postgraduate School, Monterey, Calif.
POSITION DETERMINATION WITH LORAN-C TRIPLETS AND THE HEWLETT-PACKARD HP-41CV PROGRAMMABLE CALCULATOR
Rex H. Shudde Sep. 1982 70 p refs
(AD-A122499; NPS55-82-022) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report presents an algorithm and HP-41CV programs for position determination with Loran-C chains. Additional computational routines include the ability to calibrate Loran station triplet data to a known benchmark and ITD's (Indicated Time Delay's), predict ITD's at given positions, compute the geodesic (similar to great circle) bearing and distance from a fix to the destination and to compute the geodesic bearing and distance from any one location to another. Utility routines allow the user to transfer station pair data between the HP-41CV and magnetic cards, magnetic tape and an extended function/memory module. GRA

N83-20930# Federal Aviation Agency, Atlantic City, N.J.
OPERATIONAL AND TECHNICAL EVALUATION OF THE FULL DIGITAL AUTOMATED RADAR TERMINAL SYSTEMS (ARTS) DISPLAY (FDAD) Final Report
Robert Clark and Salvador Roditi Oct. 1982 42 p
(AD-A122269; FAA-RD-82-51; FAA-CT-82-87) Avail: NTIS HC A03/MF A01 CSCL 17/9

This report discusses the operational and technical evaluation of the Full Digital Automated Radar Terminal Systems (ARTS) Display (FDAD). The FDAD was capable of providing data entry, data display, data refresh, and input/output functions of either ARTS II, ARTS III, or ARTS IIIA computer. Three different cathode-ray tube phosphors, including color, were evaluated. Data were displayed either in a full-digital mode or a time-share mode. During the time-share mode, the display of digital data was time shared with analog radar/beacon target reports. Modifications to software, hardware, and display firmware would be required to make the FDAD's operationally suitable. The technical evaluation conditionally accepts the displays, as tested, and it recommends their use as field displays, provided certain modifications are made.
Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-20931*# National Aeronautics and Space Administration, Washington, D. C.
SMALL TRANSPORT AIRCRAFT TECHNOLOGY
Louis J. Williams 1983 118 p refs
(NASA-SP-460; NAS 1.21:460; LC-82-600387) Avail: NTIS HC A06/MF A01 CSCL 01C

Information on commuter airline trends and aircraft developments is provided to upgrade the preliminary findings of a NASA-formed small transport aircraft technology (STAT) team, established to determine whether the agency's research and development programs could help commuter aircraft manufacturers solve technical problems related to passenger acceptance and use of 19- to 50-passenger aircraft. The results and conclusions of the full set of completed STAT studies are presented. These studies were performed by five airplane manufacturers, five engine manufacturers, and two propeller manufacturers. Those portions of NASA's overall aeronautics research and development programs which are applicable to commuter aircraft design are summarized. Areas of technology that might beneficially be expanded or initiated to aid the US commuter aircraft manufacturers in the evolution of improved aircraft for the market are suggested. A.R.H.

N83-20932*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL OPTIMIZATION BY MULTILEVEL DECOMPOSITION
Jaroslaw Sobieszczanski-Sobieski, Benjamin James (Kentron International, Inc.), and Augustine Dovi Mar. 1983 22 p refs Presented at the AIAA/ASME/ASCE/AHS 24th Struct., Struct. Dyn. and Mater. Conf., Lake Tahoe, Nev., 2-4 May 1983
(NASA-TM-84641; NAS 1.15:84641) Avail: NTIS HC A02/MF A01 CSCL 01C

A method is described for decomposing an optimization problem into a set of subproblems and a coordination problem which preserves coupling between the subproblems. The method is introduced as a special case of multilevel, multidisciplinary system optimization and its algorithm is fully described for two level optimization for structures assembled of finite elements of arbitrary type. Numerical results are given for an example of a framework to show that the decomposition method converges and yields results comparable to those obtained without decomposition. It is pointed out that optimization by decomposition should reduce the design time by allowing groups of engineers, using different computers to work concurrently on the same large problem. Author

N83-20933*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPUTER PROGRAM FOR OBTAINING AIRPLANE CONFIGURATION PLOTS FROM DIGITAL DATCOM INPUT DATA
Marie-Louise Roy (Kentron Technical Center, Hampton, Va.) and Steven M. Sliwa Mar. 1983 61 p refs
(NASA-TM-84639; NAS 1.15:84639) Avail: NTIS HC A04/MF A01 CSCL 01C

A computer program is described which reads the input file for the Stability and Control Digital Datcom program and generates plots from the aircraft configuration data. These plots can be used to verify the geometric input data to the Digital Datcom program. The program described interfaces with utilities available for plotting aircraft configurations by creating a file from the Digital Datcom input data. S.L.

N83-20934# Douglas Aircraft Co., Inc., Long Beach, Calif.
SERVICE EVALUATION OF AIRBORNE TIRE PRESSURE INDICATING SYSTEMS Final Report, Jan. 1980 - May 1982
Wilson W. Kwong Atlantic City, N.J. FAA Dec. 1982 166 p (Contract DTFA03-81-C-00044)
(DOT/FAA/RD-82/89; DOT/FAA/CT-82/90) Avail: NTIS HC A08/MF A01

Results of the in-service evaluation on tire pressure indicating systems are reported in this document. Two systems, one made by Goodyear and the other by Fairchild, were evaluated on two McDonnell Douglas DC-10's from March of 1980 to May of 1981. The Goodyear system employs the copper-graphite-copper journal bearing technique while the Fairchild system uses the inductive coupling (air gap transformer) method. A detailed test evaluation is included for each of the systems tested. Based on the in-service performance, the Fairchild system was selected as the production system. The first installation was completed at Long Beach in early 1982. FAA certification of Fairchild system was completed also in early 1982 with FAA Type Design approval granted for use on the DC-10-30 on February 22, 1982. Author

N83-20935# Office of Air Force History, Washington, D. C.
DEVELOPMENT AND EMPLOYMENT OF FIXED-WING GUNSHIPS, 1962-1972
Jack S. Ballard 1982 342 p refs
(AD-A122538) Avail: NTIS MF A01; SOD HC $15.00 CSCL 01/3

The development of the concept of fixed-wing assault gunships is discussed. The tactics and deployment of these gunships in Southeast Asia are discussed. The importance of input from combat personnel is discussed. R.J.F.

N83-20936# Center for Naval Analyses, Alexandria, Va. Operations Evaluation Group.
METHODS FOR GENERATING AIRCRAFT TRAJECTORIES
David B. Quanbeck Sep. 1982 58 p refs
(Contract N00014-76-C-0001)
(AD-A122386; CNA-PP-361) Avail: NTIS HC A04/MF A01 CSCL 19/4

Methods for generating three dimensional aircraft trajectories necessary for quantitatively assessing aircraft tactics are documented in this report. Elements conventionally used in modeling aircraft motion are assembled to form a model governing aircraft translation, fuel use, and attitude. Assumptions on the functional dependence of the aircraft external forces and specific fuel consumption result in a system of seven equations and eleven variables governing aircraft trajectories. To provide flexibility in prescribing aircraft trajectories, the problem of solving the equations is formulated for five separate sets of known variables. These sets include variables defining aircraft controls, velocity attitude, and velocity magnitude. Extensions to the problem formulations allow flight path normal acceleration to be prescribed, also. A method to prescribe known variables is presented that ensures continuous aircraft acceleration and angular velocity. Numerical integration, finding roots of equations, and interpolation of function values are required to solve the trajectory generation problems. Application of selected algorithms for numerical solution of the equations is discussed. Author (GRA)

N83-20937# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Health Sciences Section.
AN OPERATIONAL HYGIENE STUDY FOR OZONE IN THE CABIN OF THE CANADIAN FORCES (CC137) BOEING 707 AIRCRAFT
B. J. Gill Aug. 1982 21 p refs
(AD-A121749; DCIEM-82-R-37) Avail: NTIS HC A02/MF A01 CSCL 01/3

A study was carried out to determine the concentration of ozone in the cabin of the Boeing 707 (CC137) at altitude on a cross-Canada flight during a seasonal period of high atmospheric ozone. An ozone monitor manufactured by Columbia Scientific Industries (CSI), Austin, Texas was used to measure O3 levels during the study. Prior to actuai flight monitoring the analytical measuring equipment was calibrated at ground level and under simulated altitude conditions. Since ideal gas law corrections were not applicable at altitude it was necessary to prepare a correction factor for the CSI ozone meter under hypobaric conditions. In the flight trials, the maximum O3 value obtained during the westerly segment of the flight at an altitude of 39,000 feet, was 135 parts per billion (ppb) and 106 ppb on the return easterly portion of the flight. These values slightly exceed the Threshold Limit Value (TLV) for ozone of 100 ppb. However, they are below the Short Term Exposure Limit (STEL) of 300 ppb. During a similar time period, Atmospheric Environment Services (AES), Environment Canada, measured an ozone concentration of 1670 ppb in the atmosphere at an altitude of 39,370 feet in the Edmonton, Alberta area. A comparison of the maximum cabin concentration obtained during this study with that found externally by AES indicates that the engines of the Boeing 707 were removing greater than 90% of

the atmosphere ozone prior to its entry into the aircraft cabin. The findings of this study indicate that ancillary ozone removing equipment need not be added to the aircraft. Author (GRA)

N83-20938# Tennessee Univ., Tullahoma.
A FLIGHT TEST EVALUATION AND ANALYTICAL STUDY OF THE BALL-BARTOE JETWING PROPULSIVE LIFT CONCEPT WITHOUT EJECTOR
Ralph D. Kimberlin, Uwe P. Solies, and Atin K. Sinha 1 Oct. 1982 141 p refs
(Contract N00019-81-C-0506)
(AD-A121733; UTSI-82/17) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report covers the results of a two part research effort on the Ball-Bartoe Jetwing propulsive lift concept. This effort was conducted by the University of Tennessee Space Institute, Tullahoma, Tennessee for the Advanced Aircraft Development and Systems Objectives Office (AIR-03PA) of Naval Air Systems Command under contract Number N00019-81-C-0506. The first part of the effort, which is covered in part 1 of this report, was a follow on to a previous effort conducted under Naval Air Systems Command Contract Number N00019-80-C-1026 and reported in UTSI Report 81-1(1). The effort reported herein consisted of a performance flight test with the upper wing (ejector wing) removed, and flyover noise measurements with and without the upper wing. Performance, Stability and Control flight test with the upper wing installed were a part of the previous effort. The second part of the effort consisted of an analytical study to develop a method, or methods, to predict the aerodynamic coefficients of a Jetwing configured aircraft. These coefficients would be of sufficient accuracy for use in preliminary design studies, The results of this analytical effort are reported in part 2 of this report. Results of both the flight test and analytical effort are compared to full scale test results of the research aircraft in the NASA Ames Research Center 40' x 80' wind tunnel with the aim of evaluating the Jetwing concept for applications to future flight vehicles. GRA

N83-20939# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
AH-1 AIR GROUND ENGAGEMENT SIMULATION/AIR DEFENSE (AGES/ADES) POD JETTISON EVALUATION Final Report, 31 Aug. - 2 Sep. 1982
Richard T. Savage and Robert A. Williams Sep. 1982 29 p
(DA Proj. N61-62209-AH-76)
(AD-A122623; USAAEFA-82-06) Avail: NTIS HC A03/MF A01 CSCL 01/3

The AH-1 Air Ground Engagement Simulation/Air Defense (AGES/ADES) Pod Jettison Evaluation was conducted at Edwards Air Force Base, California (elevation 2302 feet). Six flights totaling 2.4 hours were flown from 31 August to 2 September 1982. Satisfactory jettison envelopes for the AGES/ADES pod were defined at a hover, in coordinated level flight to 130 KCAS, and in coordinated autorotation to 85 KCAS. One Equipment Performance Report was submitted pertaining to the difficulty of attaching the AGES/ADES pod to the aircraft. Author (GRA)

N83-20940# Sandia Labs., Albuquerque, N. Mex.
INVESTIGATION OF THE FEASIBILITY OF A HELICOPTER-LAUNCHED CRUISE MISSILE SYSTEM
Curtiss W. Moses Jan. 1982 13 p refs
(Contract DE-AC04-76DP-00789)
(DE82-008623; SAND-81-2415) Avail: NTIS HC A02/MF A01

In addition to determining the feasibility of a helicopter-launched cruise missile, a configuration and a concept of operations were developed that consists of a flight of three CH-53E helicopters. Two of these helicopters carry eight cruise missiles each; the third carries a security force. This flight could be dispersed to the field and maintained in the field by use of the security force helicopter and alternate load-carrying helicopters required under present regulations governing movement of nuclear weapons. Operational constraints of security and weather were investigated, and the cost of acquiring and maintaining a helicopter-launched cruise missile force was estimated. DOE

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N83-20941*# Honeywell, Inc., Minneapolis, Minn. Avionics Div.
DEMONSTRATION ADVANCED AVIONICS SYSTEM (DAAS) Final Report
Jan. 1982 161 p refs Prepared in cooperation with King Radio Corp.
(Contract NAS2-10021)
(NASA-CR-166281; NAS 1.26:166281) Avail: NTIS HC A08/MF A01 CSCL 01D

The feasibility of developing an integrated avionics system suitable for general aviation was determined. A design of reliable integrated avionics which provides expanded functional capability that significantly enhances the utility and safety of general aviation at a cost commensurate with the general aviation market was developed. The use of a data bus, microprocessors, electronic displays and data entry devices, and improved function capabilities were emphasized. An avionics system capable of evaluating the most critical and promising elements of an integrated system was designed, built and flight tested in a twin engine general aviation aircraft. S.L.

N83-20942# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
RADAR ALTIMETER TEST AND CALIBRATION STUDY, VOLUME 1 Final Report
C. R. Francis, comp. and R. J. Orme, comp. Paris ESA Jul. 1982 362 p refs Prepared in cooperation with SRC, Chilton, England
(Contract ESA-4926/81/F-DD(SC))
(ESS/SS-1077; ESA-CR(P)-1685) Avail: NTIS HC A16/MF A01

The radar altimeter proposed for the ERS-1 satellite is a pulse width limited instrument, in which the shape of the leading edge of the return enables the ocean wave height to be measured. The altimeter has a performance specification similar to the highly successful SEASAT altimeter. Tests to determine whether these specifications are met and methods for calibrating the instrument are described. Overall error sources discussed include altitude, significant wave height, and backscatter coefficient. Characteristics of the signal backscatter from the sea, testing of the processor and the microwave subsystems, in-orbit calibration, errors occurring in the instrument due to rf effects, and the development of a returned signal simulator are covered. A.R.H.

N83-20943# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Crew Systems Effectiveness Branch.
ANGULAR DEVIATION AND ITS EFFECT ON HUD-EQUIPPED AIRCRAFT WEAPONS SIGHTING ACCURACY
Louis V. Genco Aug. 1982 23 p refs
(AF Proj. 7184)
(AD-A122547; AFAMRL-TR-82-43) Avail: NTIS HC A02/MF A01 CSCL 01/3

At present, all forward windscreens (or canopies) installed on HUD-equipped aircraft are measured to determine their angular deviation, or induced aiming error. Standards have been set to accept only those transparencies which cause little aiming error, and at least one aircraft HUD fire control computer is provided with a means to compensate for the remaining error. This report is a summary of several of the multitudinous methods used to measure angular deviation for most HUD-equipped aircraft, with an explanation of the comparative accuracy of each method when applied to weapons aiming at operational sighting ranges. The advantages and disadvantages of each quality control system are discussed, and an attempt is made to reconcile the values of each system for sighting accuracy comparisons. A recommendation is made for a standardized method of measurement which is relatively error free, and best relates to operational use of the aircraft. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-20944* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ELECTRICAL ROTARY JOINT APPARATUS FOR LARGE SPACE STRUCTURES Patent

Robert R. Belew and Richard J. Boehme, inventors (to NASA) Issued 4 Feb. 1981 8 p Filed 4 Feb. 1981 Supersedes N81-19394 (19 - 10 p 1345)

(NASA-Case-MFS-23981-1; US-Patent-4,377,266; US-Patent-Appl-SN-231543; US-Patent-Class-244-159; US-Patent-Class-322-2R; US-Patent-Class-339-5R; US-Patent-Class-339-3R; US-Patent-Class-343-DIG2; US-Patent-Class-244-173) Avail: US Patent and Trademark Office CSCL 21E

A structural array and electrical rotary joint for transmitting an electrical power between large space structures having relative rotational movement is disclosed which includes large support framework structures which rotate relative to one another about a common axis of rotation. A rotary interface joint is defined between the structures. A cylindrical hub member is carried by one structure and a cylindrical hub member is carried by a support structure with a third hub member being concentrically within a fourth hub member for relative rotation. Tension connecting cables connect hub members with their associated outer structures whereby relative rotational movement between the structures is transmitted to the cylindrical hub members for unitary motion therewith. Electrical conductor brush members are carried by one hub and electrical contact rings are carried by another hub member in sliding electrical contact with the brushes for transmission of electrical power during relative rotational movement between the two support structures.

Official Gazette of the U.S. Patent and Trademark Office

N83-20945*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.

ALTERNATIVES FOR JET ENGINE CONTROL Annual Technical Progress Report, 1 Oct. 1981 - 30 Sep. 1982

Michael K. Sain, Stephen Yurkovich, Joe P. Hill, and Thomas A. Kingler 23 Mar. 1983 197 p refs

(Grant NsG-3048)

(NASA-CR-170100; NAS 1.26:170100) Avail: NTIS HC A09/MF A01 CSCL 21E

The development of models of tensor type for a digital simulation of the quiet, clean safe engine (QCSE) gas turbine engine; the extension, to nonlinear multivariate control system design, of the concepts of total synthesis which trace their roots back to certain early investigations under this grant; the role of series descriptions as they relate to questions of scheduling in the control of gas turbine engines; the development of computer-aided design software for tensor modeling calculations; further enhancement of the softwares for linear total synthesis, mentioned above; and calculation of the first known examples using tensors for nonlinear feedback control are discussed. Author

N83-20946*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.

THE RENE 150 DIRECTIONALLY SOLIDIFIED SUPERALLOY TURBINE BLADES, VOLUME 1 Final Report

G. J. DeBoer Dec. 1981 116 p refs

(Contract NAS3-20074)

(NASA-CR-167992; NAS 1.26:167992; R82AEB540-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 21E

Turbine blade design and analysis, preliminary Rene 150 system refinement, coating adaptation and evaluation, final Rene 150 system refinement, component-test blade production and evaluation, engine-test blade production, and engine test are discussed. N.W.

N83-20947*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW TRENDS IN COMBUSTION RESEARCH FOR GAS TURBINE ENGINES

Edward J. Mularz 1983 13 p refs Proposed for presentation at 6th Intern. Symp. on Air Breathing Engines, Paris, 6-11 Jun. 1983; sponsored by the International Society on Air Breathing Engines and the Association Aeronautique et Astronautique de France Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, Ohio

(NASA-TM-83338; E-1590; NAS 1.15:83338; AVRADCOM-TR-83-C-1) Avail: NTIS HC A02/MF A01 CSCL 21E

Research on combustion is being conducted to provide improved analytical models of the complex flow and chemical reaction processes which occur in the combustor of gas turbine engines, in order to enable engine manufacturers to reduce the development time of these concepts. The elements of the combustion fundamentals program is briefly discussed with examples of research projects described more fully. Combustion research will continue to emphasize the development of analytical models and the support of these models with fundamental flow experiments to assess the models accuracy and shortcomings. S.L.

N83-20948*# Pennsylvania State Univ., University Park.

THE STRUCTURE OF PARTICLE-LADEN JETS AND NONEVAPORATING SPRAYS Final Report

J.-S. Shuen, A. S. P. Solomon, Q.-F. Zhang, and G. M. Faeth Feb. 1983 73 p refs

(Contract NAG3-190)

(NASA-CR-168059; NAS 1.26:168059) Avail: NTIS HC A04/MF A01 CSCL 21E

Mean and fluctuating gas velocities, liquid mass fluxes and drop sizes were in nonevaporating sprays. These results, as well as existing measurements in solid particle-laden jets, were used to evaluate models of these processes. The following models were considered: (1) a locally homogeneous flow (LHF) model, where slip between the phases was neglected; (2) a deterministic separated flow (DSF) model, where slip was considered but effects of particle dispersion by turbulence were ignored; and (3) a stochastic separated flow (SSF) model, where effects of interphase slip and turbulent dispersion were considered using random-walk computations for particle motion. The LHF and DSF models did not provide very satisfactory predictions over the present data base. In contrast, the SSF model performed reasonably well - including conditions in nonevaporating sprays where enhanced dispersion of particles by turbulence caused the spray to spread more rapidly than single-phase jets for comparable conditions. While these results are encouraging, uncertainties in initial conditions limit the reliability of the evaluation. Current work is seeking to eliminate this deficiency. Author

N83-20949# Council for Scientific and Industrial Research, Pretoria (South Africa).

REPORT ON OVERSEAS VISIT

G. V. Hobson Jul. 1982 29 p

(NIAST-82-46; ISBN-0-7988-2510-3) Avail: NTIS HC A03/MF A01

The 27th International Gas Turbine Conference, a von Karman Institute lecture series on numerical methods for flows in turbomachinery blades, and visits to various gas turbine manufacturers are reported. Author

N83-20950# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A SYSTEM DYNAMICS POLICY ANALYSIS MODEL OF THE AIR FORCE ENGINE MANAGEMENT SYSTEM M.S. Thesis

Gordon K. LeMaire Sep. 1982 224 p refs
(AD-A122829; AFIT-LSSR-92-82) Avail: NTIS HC A10/MF A01 CSCL 15/5

The Air Force contains several complex management systems. These systems are, for the most part, examples of goal-oriented, feedback control systems. They often display counter-intuitive behavior in their operations. One of the best ways to study these systems is by using computer simulation techniques. Forrester has developed a system dynamics simulation technology, DYNAMO, which can be used to study such complex systems. The Air Force engine management system is one of these systems. Additionally, it is an example of a multi-item, multiechelon production and inventory system. Forrester's work with these systems indicated that they are unstable and this instability is due to the structure of the system. This thesis modified an existing DYNAMO simulation model to study the operation of the engine management system. Personal experience, interviews with system managers, and a literature review indicated that this was an acceptable choice. The results of the model's operation were reported. The model is a reasonable approximation of the engine management system. Recommendations for model expansion and improvement are presented. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N83-20951*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
THE INTEGRATED MANUAL AND AUTOMATIC CONTROL OF COMPLEX FLIGHT SYSTEMS Semiannual Status Report, 1 Jul. - 31 Dec. 1982
David K. Schmidt 3 Mar. 1983 42 p refs
(Grant NAG4-1)
(NASA-CR-170099; NAS 1.26:170099) Avail: NTIS HC A03/MF A01 CSCL 01C

Development of a unified control synthesis methodology for complex and/or non-conventional flight vehicles, and prediction techniques for the handling characteristics of such vehicles are reported. Identification of pilot dynamics and objectives, using time domain and frequency domain methods is proposed. N.W.

N83-20952*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
ENHANCED MANUAL CONTROLLABILITY VIA ACTIVE CONTROL OF AEROELASTIC VEHICLES Semiannual Status Report, 1 Aug. 1982 - 31 Jan. 1983
David K. Schmidt 1983 58 p refs
(Grant NAG1-254)
(NASA-CR-170118; NAS 1.26:170118) Avail: NTIS HC A04/MF A01 CSCL 01C

A modal analysis technique was developed for evaluating the effects of elastic modes on aircraft dynamic response, and the handling qualities implication of these effects. Author

N83-20897# Royal Aircraft Establishment, Farnborough (England).
DYNAMIC RESPONSE OF AIRCRAFT WITH FLUCTUATING FLOW FIELDS
J. G. Jones *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 24 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20898# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
AEROELASTIC BUFFETING PREDICTION TECHNIQUE. A GENERAL REVIEW
H. Foersching *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 49 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

N83-20899# Royal Aircraft Establishment, Bedford (England).
SOME REMARKS ON BUFFETING
D. G. Mabey *In* Von Karman Inst. for Fluid Dynamics Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 15 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N83-20953# Committee on Science and Technology (U. S. House).
FAA NATIONAL AIRSPACE SYSTEM PLAN
Washington GPO 1982 221 p Hearings before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., no. 86, 28-29 Apr. 1982
(GPO-94-438) Avail: Subcommittee on Transportation, Aviation and Materials

The following items of concern were discussed: data links, remote maintenance monitoring, consolidation of air route traffic control centers, new DOT/FAA communications network, development of long range radar, flight service station modernization, sector suites, traffic alert and collision avoidance systems (TCAS), microwave landing system, and national airspace review (NAR). B.G.

N83-20954# Spectrolab, Inc., Sylmar, Calif. Illumination Systems Dept.
STUDY OF A MODEL A6000 SOLAR SIMULATOR FOR THE ESTEC DYNAMIC TEST CHAMBER Final Report
James N. Lovelady and W. A. Shickle Paris ESA 19 May 1982 81 p
(Contract ESTEC-4783/81/NL-PP(SC))
(Spectrolab-Quote-81637; ESA-CR(P)-1645) Avail: NTIS HC A05/MF A01

The relative merits of the four best simulator configurations are examined in the light of trade-offs between the extent of building modifications and the cost and efficiency of the proposed simulator. Drawings for each of the above are included. Expected light uniformity, efficiency, irradiation range and stability are discussed. The overall design is covered here for the proposed optical, electrical, mechanical and thermal parameters inherent in the required solar simulator. Included are all the safety features necessary to protect any nearby personnel and all vulnerable equipment. Some options are discussed for different beam shapes and sizes as well as transfer optics packages and their trade-offs. Light beam uniformity measurement and stability control are also covered. Author (ESA)

N83-20955# RAND Corp., Santa Monica, Calif.
THE TAXIWAY REPAIR SCHEDULE PROBLEM: A HEURISTIC RULE AND A BRANCH-AND-BOUND SOLUTION Interim Report
Louis H. Wegner Oct. 1982 39 p refs
(Contract F49620-82-C-0018)
(AD-A122497; RAND/N-1883-AF) Avail: NTIS HC A03/MF A01 CSCL 12/1

After an attack on an airbase, the system of taxiways that connect aircraft shelters or parking areas to the airbase runway may be so damaged that some of the aircraft are not able to reach the runway. In this Note, the Taxiway Repair Schedule Problem is defined to be the problem of finding the optimal sequence for repairing the damaged taxiway sections, assuming

that each section has a known repair time and that the sections are repaired one at a time. An optimal taxiway repair sequence minimizes the average time that aircraft have been denied access to the runway. Two procedures are presented for selecting repair schedules: one, a branch-and-bound algorithm, actually determines an optimal schedule, but at a high computational cost (which becomes infeasibly high for large number of damaged taxiway sections); the second, a heuristic rule, is computationally simple but does not select optimal schedules for all problems. The two procedures are compared for 100 example problems. GRA

N83-20956# National Security Industrial Association, Washington, D. C.
PROCEEDINGS OF THE 4TH INTERSERVICE/INDUSTRY TRAINING EQUIPMENT CONFERENCE
1982 561 p refs Conf. held in Washington, 16-18 Nov. 1982 2 Vol.
(AD-A122155) Avail: NTIS HC A24/MF A01 CSCL 05/9

The goal of the Interservice/Industry Training Equipment Conference is to serve as a forum to foster communication. Through technical papers, panels, equipment exhibits, and individual discussions, problems are aired, needs are defined, and plans are specified to develop alternatives and solutions. The papers contained in these proceedings are an attempt to document both industry's and government's views. While past conferences have covered a wide range of training topics, it has become increasingly recognized that the voice of the user must be heard. The training equipment user is daily confronted with a diversity of unique difficulties which are frequently unseen by others in the training cycle. The Fourth Interservice/Industry Training Equipment Conference is, therefore, focused on the user. Our goal is to communicate the user's views to those in government and industry and hopefully improve the resultant training product. GRA

N83-20957# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
WALL INTERFERENCE IN WIND TUNNELS
London Sep. 1982 222 p refs Conf. held in London, 19-20 May 1982
(AGARD-CP-335; ISBN-92-835-0321-X) Avail: NTIS HC A10/MF A01

Current usage and basic developments for wind tunnel wall corrections are addressed including Reynolds number corrections, wall and support interference, flow quality and aeroelasticity. Solid wall, ventilated wall, and adaptive wall wind tunnels are among the topics discussed. Progress in the area of wind tunnel correction is evident with adaptive walls to reduce or eliminate wall interference. For individual titles, see N83-20958 through N83-20973.

N83-20958# Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
A METHOD FOR DETERMINING WALL-INTERFERENCE CORRECTIONS IN SOLID-WALL TUNNELS FROM MEASUREMENTS OF STATIC PRESSURE AT THE WALLS
P. R. Ashill and D. J. Weeks *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 12 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

A method is described for calculating wall interference in solid wall tunnels from measurements of pressures at the walls. The method has the advantage over similar techniques of not requiring a description of the flow in the region of the model. Calculations of wall interference for aerofoil tests at high subsonic speeds are presented, and the wall corrections obtained are compared with results from other methods. Generally good agreement is obtained. A theoretical evaluation of the method suggests that it is suitable for calculating wall corrections for three dimensional configurations that are not amendable to correction by classical methods. Author

N83-20959# British Aerospace Aircraft Group, Brough (England).
THE USE OF PANEL METHODS FOR THE EVALUATION OF SUBSONIC WALL INTERFERENCE
D. R. Holt and B. Hunt *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 16 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

The use of panel methods is discussed for the evaluation of subsonic wall interference effects in both two and three dimensions. The techniques that the experimenter must adopt in order to use the methods efficiently and accurately were evaluated rather than on once and for all corrections. Particular examples are given to illustrate the general approach together with further uses of panel methods in the general field of support interference. Author

N83-20960*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMILARITY RULES FOR EFFECTS OF SIDEWALL BOUNDARY LAYER IN TWO-DIMENSIONAL WIND TUNNELS
Richard W. Barnwell and William G. Sewall *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 10 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01 CSCL 14B

A simple analysis of the interaction of the model pressure field with the boundary layer on an unventilated wind tunnel wall is presented. It is shown that the effects of this interaction are similar to compressibility effects for sidewall boundary layers in two dimensional wind tunnels. This similarity is used to derive modified forms of the Prandtl Glauert rule for subsonic flow and the von Karman rule for transonic flow which are validated by comparison with experimental data. The three dimensional interaction problem is discussed, and it is shown that model pressure field/wall boundary layer interaction effects are not similar to compressibility effects in three dimensional wind tunnels. Author

N83-20961# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Flugzeuge.
REYNOLDS NUMBER EFFECTS ON TRANSONIC SHOCK LOCATION
F. Aulehla and A. Eberle *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 12 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

The example of a variable density transonic wind tunnel shows that the boundary layer displacement at the test section wall is about hundred times bigger than the corresponding effects at the model. Computations using variable boundary conditions at the test section wall show that the shock location on an axisymmetric body is noticeably altered. These computed shifts in shock location agree very well with those measured in the wind tunnel leaving little room for true Reynolds number effects on the model itself. Lastly, an opposite and purely theoretical approach is presented, in which the shock location on a Korn profile was computed for the free flight case and for a model boundary layer assumed to be fully turbulent. The results show that for this particular example with fixed transition there is only a negligible change in shock location when Reynolds number is raised from 4 million to 20,000 million. The conclusion drawn from these three different examples is that the true Reynolds number effects on transonic shock location appear to be by orders of magnitudes smaller than generally quoted from variable density wind tunnel measurements. B.G.

N83-20962# Group for Aeronautical Research and Technology in Europe, Amsterdam (Netherlands).
TWO-DIMENSIONAL TRANSONIC TESTING METHOD
A. Elsenaar and E. Stanewsky *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 16 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Measurements were made of the CAST-7/DOA1 airfoil in 7 European facilities, involving perforated, slotted and flexible wall wind tunnels. A comparison was made of the 'best data available' for each tunnel, using various wall interference correction methods. Also, a limited comparison of some of the correction methods themselves was carried out. A large variation in experimental results was found for the uncorrected data. However, different types of

correction methods reduce this scatter considerably. From this comparison it can be concluded that measured boundary condition methods and the flexible wall concept appear to be very promising. It is expected that a further analysis of these preliminary results might reduce the experimental uncertainty even more, so establishing a well defined data base for viscous transonic flow computational methods. Author

N83-20963# Royal Inst. of Tech., Stockholm (Sweden).
FLOW PROPERTIES OF SLOTTED-WALL TEST SECTIONS
Sune B. Berndt *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 7 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

A brief survey of results and problems relevant to the objective of eliminating wall interference in three-dimensional transonic tests by proper shaping of the slots was evaluated. The principal features of the flow in a slotted test section are described and then illustrated by experimental results from two FFA wind tunnels. The importance of maintaining free stream velocity to the full depth of the slots is stressed; the viscous effects evident in the experiments are viewed against this need. The classical inviscid flow model of two dimensional slotted wall flow is compared with experiments and shown to give fair agreement in its range of validity. A fully three dimensional and general inviscid flow model is described briefly and interference free slot shapes for axisymmetric flows computed with this flow model are reviewed. Finally, problems of correcting the theoretical results for viscous effects are touched upon.
Author

N83-20964# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
WALL BOUNDARY-LAYER EFFECTS IN TRANSONIC WIND TUNNELS
Y. Y. Chan *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 15 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Boundary layer developments on the perforated walls and the sidewalls of a transonic two dimensional wind tunnel have been studied experimentally and computationally. For the upper and lower walls, the wall characteristics are strongly modulated by the boundary layer and a correlation depending explicitly on the displacement thickness is obtained. A method of calculating the boundary-layer displacement effect is derived, providing the boundary condition for the interference flow in the tunnel. For the sidewalls, the three dimensional boundary layer developments at the vicinity of the model mount has been calculated and its displacement effect analyzed. The effectiveness of controlling the adverse effects by moderate surface suction is demonstrated.
Author

N83-20965# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Aerodynamische Versuchsanstalt.
THREE-DIMENSIONAL WALL CORRECTIONS FOR VENTILATED WIND TUNNELS
H. Holst *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 11 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Correction factors (angle of incidence and flow curvature) have been calculated or ventilated wind tunnels by the vortex lattice method. For the cases of open and closed test sections these results agree very good with those calculated using the image technique. For ventilated walls (slotted and/or perforated) results are presented. The vortex lattice method is then used to calculate wall pressures in closed and ventilated test sections. Measurements in a 1.3m closed square test section were made using circular discs for blockage and a rectangular wing as a lift generator. The results (wall pressure distributions and force coefficients) are presented and will be a basis of comparison for wall pressures in a slotted wall test section. Author

N83-20966# National Aerospace Lab., Amsterdam (Netherlands).
MEASURED BOUNDARY CONDITIONS METHODS FOR 2D FLOW
J. Smith *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 15 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Modern developments in wind tunnel wall correction methods are for a major part directed towards the use of in situ measured boundary conditions in order to eliminate the need to describe the complicated aerodynamic characteristics of test section walls. This paper presents a short general review of the principles of such methods for two dimensional flow. The major practical problems associated with the application of the methods are discussed and some typical results are shown. Author

N83-20967# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Lab.
SUBSONIC WALL INTERFERENCE CORRECTIONS FOR FINITE-LENGTH TEST SECTIONS USING BOUNDARY PRESSURE MEASUREMENTS
M. Mokry *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 15 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Subsonic wall interference corrections by using the Fourier solution for the Dirichlet problem in a circular cylinder, interior to the three dimensional test section were evaluated. The required boundary values of the streamwise component of wall interference velocity are obtained from pressure measurements by a few static pressure tubes located on the cylinder surface. The coefficients of the resultant Fourier-Bessel series are obtained in closed form and the coefficients of the Fourier sine series are calculated by the fast Fourier transform, so that the method is very efficient and suitable for routine tunnel testing. E.A.K.

N83-20968# Office National d'Etudes et de Recherches Aeronautiques, Paris (France).
IMPROVING CALCULATIONS OF WALL EFFECTS IN INDUSTRIAL WIND TUNNELS AT ONERA [AMELIORATIONS DES CALCULS DES EFFETS DE PAROIS DANS LES SOUFFLERIES INDUSTRIELLS DE L'ONERA]
Xavier Vaucheret *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 12 p refs In FRENCH; ENGLISH summary (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Methods used to compute wall interference corrections for the ONERA large wind tunnels were improved over the years. The mathematical description of the model and its sting support is more and more sophisticated; an increasing number of singularities is used until an agreement between theoretical and experimental signatures of the model and sting on the walls of the closed test section is obtained. The effect of the singularity displacement from the central position is calculated when the model reaches large angles of attack. The porosity factor cargography on the perforated walls deduced from the measured signatures avoids to carry out reference tests in large tunnel as previously. The porosity factors obtained from the blockage terms (signatures at zero lift) and from the lift terms are in good agreement. In each case (model + sting + test section) wall corrections are now determined, before the tests, as a function of the fundamental parameters M, CD, Cl. During the wind tunnel tests, the corrections are quickly computed from these functions. Author

N83-20969# Technische Univ., Berlin (West Germany). Inst. fuer Luft-und Raumfahrt.
ON THE USE OF ADAPTIVE WALLS FOR TRANSONIC WIND TUNNEL TESTING
U. Ganzer *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 8 p refs Sponsored in part by the German Ministry of Science and Technology and the German Research Association (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

A wind tunnel test section with two adaptive walls for aerofoil testing and another one with eight flexible walls for 3-D model

tests was developed. The constructional features, the calculation procedure for determining the adapted wall configuration and the computer based automatic control system are described. Test results obtained for the supercritical aerofoil CAST 7 are presented to demonstrate the potentiality of the adaptive wall concept in 2-D model tests. First test result with the 3-D test section using an ONERA C 5 body of revolution verify the feasibility of the adaptive wall technique for three dimensional model tests. An alternative 3-D test section design is discussed. E.A.K.

N83-20970# Office National d'Etudes et de Recherches Aeronautiques, Paris (France). Div. Aerodynamique Experimentale.
USE OF ADAPTIVE WALLS IN 2D TESTS [UTILISATION DE PAROIS ADAPTABLES POUR LES ESSAIS EN COURANT PLAN]
J. P. Archambaud and J. P. Chevallier *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 14 p refs In FRENCH; ENGLISH summary (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

A new method for computing wall effects which answers questions arising from wall concept applications is outlined. The method computes: length of adapted regions, fairings with up and downstream regions, residual misadjustments effects, and reference conditions. The acceleration of the iterative process convergence and the development of an efficient technoiogy used in CERT T2 wind tunnel gives the required test conditions in a single run. The efficiency of the whole process to obtain significant results with consideration of 3D case extension is demonstrated. E.A.K.

N83-20971*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
THE STATUS OF TWO- AND THREE-DIMENSIONAL TESTING IN THE UNIVERSITY OF SOUTHAMPTON TRANSONIC SELF-STREAMLINING WIND TUNNEL
S. W. D. Wolf, I. D. Cook, and M. J. Goodyer *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 14 p refs Sponsored in part by the British Science and Engineering Research Council (For primary document see N83-20957 11-09)
(Grant NsG-7172)
Avail: NTIS HC A10/MF A01

An automated test section was used to develop a flexible walled testing technique which eliminates some sources of uncertainty in boundary interference effects which exist in conventional transonic test sections. The flexible floor and ceiling of the test section were adjusted to contours which produce a constant Mach number distribution along each wall with no model present. These aerodynamically straight contours form the basis for all streamlining. The wall data are to contain information on the models performance and on lift. Two dimensional validation testing has continued with a cambered NPL 9510 section. Lift data up to Mach 0.87 are compared with reference data. Drag information on a NACA 0012-64 section is presented to indicate the powerful effects of streamlining. Preliminary three dimensional testing in the two dimensional test section has demonstrated that model and support blockage can be relieved by wall contouring. E.A.K.

N83-20972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADAPTIVE-WALL WIND-TUNNEL RESEARCH AT AMES RESEARCH CENTER
Edward T. Schairer and Joel P. Mendoza *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 13 p refs (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

Adaptive-wall wind-tunnel research is summarized. This research includes small-scale two- and three-dimensional wind-tunnel experiments and numerical experiments with a three-dimensional adaptive-wall simulator. Airflow through the test-section walls is controlled by adjusting the pressures in segmented plenums. Interference free conditions are successfully attained in subsonic and transonic flows. An adaptive wall test section is constructed for the transonic wind tunnel. Wall interference was reduced in the three dimensional experiment at several angles of attack at Mach 0.60. A wing on wall configuration was modeled in the numerical experiments. These flow simulations showed that free air conditions can be approximated by adjusting boundary conditions at only the floor and ceiling of the test section. No sidewall control was necessary. E.A.K.

N83-20973# ARO, Inc., Arnold Air Force Station, Tenn.
DEVELOPMENT OF A THREE-DIMENSIONAL ADAPTIVE WALL TEST SECTION WITH PERFORATED WALLS
R. L. Parker, Jr. and J. C. Erickson, Jr. *In* AGARD Wall Interference in Wind Tunnels Sep. 1982 14 p refs Sponsored in part by AFSC (For primary document see N83-20957 11-09)
Avail: NTIS HC A10/MF A01

The two dimensional, porous adaptive wall development is described. Three dimensional experiments employing adaptive techniques to adjust variable porosity walls individually to minimize the interference on a generalized transonic model are summarized. The embodiment of the adaptive wall concept for three dimensional applications was investigated. A fully automated, computer controlled, closed loop three dimensional adaptive wall system was designed. Development of the subsystems includes the interface measurement instrumentation, the exterior-flow computation method, the actively controllable wall configuration, microprocessor-controlled hardware for the walls and instrumentation and the overall minicomputer based adaptive wall control algorithm. A two velocity component static pipe system is selected for the interface measurement system. Transonic small disturbance theory is used to compute the exterior flow region and a segmented, variable porosity configuration is selected for the test section walls. E.A.K.

N83-20905# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
WIND TUNNEL WALL INTERFERENCE IN UNSTEADY TRANSONIC TESTING
N. C. Lambourne *In its* Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flow 1981 17 p refs (For primary document see N83-20894 11-01)
Avail: NTIS HC A15/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N83-20974*# Battelle Columbus Labs., Ohio.
AN ASSESSMENT OF POTENTIAL DETECTORS TO MONITOR THE MAN-MADE ORBITAL DEBRIS ENVIRONMENT Final Report
R. C. Reynolds and G. T. Ruck 28 Feb. 1983 107 p refs
(Contract NAS9-16721)
(NASA-CR-167833; NAS 1.26:167833) Avail: NTIS HC A06/MF A01 CSCL 22A

Observations using NORAD radar showed that man made debris exceeds the natural environment for large objects. For short times (a few days to a few weeks) after solid rocket motor (SRM) firings in LEO, man made debris in the microparticle size range also appears to exceed the meteoroid environment. The properties of the debris population between these size regimes is currently unknown as there has been no detector system able to perform the required observations. The alternatives for obtaining data on this currently unobserved segment of the population are assessed. Author

N83-20975*# Texas Univ., Dallas.
A RESEARCH IN SUPPORT OF NASA'S SPACE SCIENCE Semiannual Status Report, 1 Oct. 1981 - 31 Mar. 1982
W. B. Hanson Aug. 1982 28 p refs
(Grant NGL-44-004-130)
(NASA-CR-170162; NAS 1.26:170162) Avail: NTIS HC A03/MF A01 CSCL 22A

Instrumentation, the interpretation of data from space-borne

instruments and the development of theoretical studies of the Earth's environment are reported. New circuitry was introduced to the existing ion drift meter to enable the detection of light ion velocities that are different from the major ion species. Significant progress was made in the tailoring of magnetic mass analysis to stratospheric ions where care must be taken to preserve the original species and to obtain good mass resolution at high mass numbers. Also a rugged and durable zoom imaging spectrometer was successfully tested and important modifications are being undertaken to allow larger scanning ranges for observation of weak airglow emissions from the Earth's atmosphere. Data interpretation efforts led to the discovery of a new class of plasma irregularities on the bottomside of the F-region. Studies of all the available plasma properties from satellite measurements in the high latitude ionosphere revealed regions of field aligned currents where it is reasonable to expect thermal electrons to be the dominant current carriers. Author

N83-20976# MATRA Espace, Paris-Velizy (France).
ADAPTATION OF THE MULTIMISSION PLATFORM/(PFM) FOR THE ERS MISSION. PART 1: PFM MISSION LIFETIME EXTENSION TO THREE YEARS Final Report
J. M. Darroy Paris ESA 19 Apr. 1982 121 p In FRENCH; ENGLISH summary 4 Vol.
(Contract ESA-4812/81/DD(SC))
(DM-51/JMD/MA/506.81; ESA-CR(P)-1675-Vol-1) Avail: NTIS HC A06/MF A01

The multimission platform is described and its reliability requirements for the SPOT project are reviewed. The status of reliability analysis for a 2-year mission is discussed as well as reliability assessment for a 3-year ERS mission. Failure modes, critical items, and lifetime and reliability limitations are examined to determine the risks involved in using the platform for longer missions. Transl. by A.R.H.

N83-20977# MATRA Espace, Paris-Velizy (France).
ADAPTATION OF THE MULTIMISSION PLATFORM/(PFM) FOR THE ERS MISSION. PART 2: POWER SUBSYSTEM ADEQUACY Final Report
J. Cornet, Y. Dubois, and P. Leblanc Paris ESA 9 Aug. 1982 125 p refs 4 Vol.
(Contract ESA-4812/81/DD(SC))
(DM-51/JC/JP/0226.82; ESA-CR(P)-1675-Vol-2) Avail: NTIS HC A06/MF A01

The ERS mission has high energy requirements and is at the limits of the PFM maximum energy supply capability. Topics covered include the payload distribution network, active microwave instrument perturbation, and the hybrid solid state switch. The solar array power increase from 1.9 KW to 2.2 KW BOL appears feasible. The EBLOS program was used to model the solar array, the battery, the shunt regulator and loads. Battery charge control was determined and different power subsystem networks for autonomous charge control of each Ni Cd battery were examined. A.R.H.

N83-20978# MATRA Espace, Paris-Velizy (France).
ADAPTATION OF THE MULTIMISSION PLATFORM/(PFM) FOR THE ERS MISSION. PART 3: EFFECTS OF THE SAR AND SCATTEROMETER ANTENNAS Final Report
J. Cornet, M. Ayoun, M. Kerebel, D. Pawlak, E. Dutto, and J. P. Vormus Paris ESA 19 Apr. 1982 168 p refs 4 Vol.
(Contract ESA-4812/81/DD(SC))
(DM-51E/JC/JP/0039.82; ESA-CR(P)-1675-Vol-3) Avail: NTIS HC A08/MF A01

The impacts of the large ERS antennas on multimission platform performances were investigated. Results show that a perturbing torque due to the yaw thrusters impingement on the SAR antenna discreases AOCS efficiency in normal mode and implies the non-action of the impinging thrusters in safe mode. A move of SAR and scatterometer antenna is recommended. A hot spot case was identified in an improbable configuration of the satellite. This hot spot case is due to scatterometer antennas shadowing on the solar array. A modification by 3 deg of platform temperatures is due to antennas' thermal coupling or shadowing. A.R.H.

N83-20979# MATRA Espace, Paris-Velizy (France).
ADAPTATION OF THE MULTIMISSION PLATFORM/(PFM) FOR THE ERS MISSION. PART 4: FEASIBILITY OF SATELLITE ROLL TILTING Final Report
J. Corent, M. Avoun, D. Pawlak, E. Dutto, and J. P. Vormus Paris ESA 19 Apr. 1982 105 p refs 4 Vol.
(Contract ESA-4812/81/DD(SC))
(DM-51E/JC/JP/0053.82; ESA-CR(P)-1645-Vol-4) Avail: NTIS HC A06/MF A01

The effects on multimission platform performances of a + or - 20 deg roll tilt of the satellite were studied. This tilt would permit SAR operation at different incidence angles for scientific purposes. The principal findings show: (1) the satellite attitude measurement accuracy is slightly decreased and the AOCS control loops and software must be modified; (2) The TTC link budget remains correct; solar array occultations are changed; (3) the Solar Array power is slightly reduced, and (4) The PFM thermal control has to be adapted if the satellite remains tilted for several orbits. A.R.H.

N83-20980# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
SPACELAB FOLLOW-ON DEVELOPMENT MEDIUM TERM STUDY. VOLUME 1: EXECUTIVE SUMMARY. PART A: UNMANNED PLATFORMS
Paris ESA Apr. 1981 55 p 3 Vol.
(Contract ESA-4713/81/F-HEW(SC))
(ESA-CR(P)-1676) Avail: NTIS HC A04/MF A01

After the successful first three launches of the Space Shuttle and the Spacelab Program reaching its final development stage with the delivery of the first flight unit to NASA in 1981, and the second flight unit in mid 1982, future mission planning will embrace the attributes of an integrated Space System which provides an economical operation and a high degree of mission/system flexibility. Mission plans include growth potential to accept future requirements as they evolve and change over the next decade. To provide a greater application, scientific and economic base, the mechanism to encourage further international participation is an integral part of this planning. The concept of free flying platforms was shown to be a vital addition to the present STS (Space Transportation System), by providing the capability for technical, schedule and funding flexibility. Platform concepts like the Science and Application Manned Space Platform and the Space Operations Center are presently under investigation in the United States. Spacelab elements, like the pallet and the pressurized module including the related subsystems, designed for transportation with the Space Shuttle, have a large potential of forming part of those a.m. platforms. Author

N83-20981# Aeritalia S.p.A., Torino (Italy). Settore Spazio.
SPACELAB FOLLOW-ON DEVELOPMENT MEDIUM TERM STUDY. VOLUME 1: EXECUTIVE SUMMARY. PART B: MANNED PLATFORMS Final Report
Paris ESA 9 Apr. 1982 110 p
(Contract ESA-4714/81/F-HEW(SC))
(MT-AI-RP-003; ESA-CR(P)-1677) Avail: NTIS HC A06/MF A01

Assessment of the applicability of Spacelab derived hardware an extensive review of requirements for future space platforms and facilities was conducted, followed by pertinent analyses and tradeoffs and layout ground work for preliminary design concept definition. Part A deal with the applicability of Spacelab elements for unmanned facilities and system aspects for manned module applications. Part B deals with the Spacelab module applications for future manned space platforms, with emphasis on structural and thermal aspects. B.G.

N83-20982# European Space Agency, Paris (France). International Relations Service.
SPACE SCIENCE AND TECHNOLOGY IN EUROPE TODAY
T. D. Guyenne, ed. and B. Battrick, ed. Jun. 1982 108 p Presented at 2nd UN Conf. on Space UNISPACE-82, Vienna, 9-21 Aug. 1982

Original contains color illustrations
(ESA-BR-07; ISSN-0250-1589) Avail: NTIS HC A06/MF A01; ESA, Paris FF80 (EEC) FF 90 (for others)

Europe's achievements in space are described. The position in the fields of space science, space applications and launch capabilities, both within Europe and outside, particularly in developing countries are noted. Prospects for Europe and the developing countries are discussed. A review of the programs undertaken within ESA and by the specialized national agencies is presented. S.L.

N83-20983# Rockwell International Corp., Downey, Calif. Satellite Systems Div.
GPS/IGS DESIGN ANALYSIS REPORT, VOLUME 1
E. J. Dryer, comp. and P. J. Berndsen, comp. 15 Nov. 1982 269 p
(Contract F04701-76-C-0216)
(AD-A122373; SSD-82-0165-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 15/3

The validation test has verified that the SPL IGS/GPS operates as specified without impact to the basic GPS navigation mission. The test program involved integration and testing of the complete SPL IGS system installed on the GPS vehicle. Anechoic chamber tests were run with both payloads operating and with all transmitters operating at full power. No detectable cross coupling of transmitter/receiver combinations was observed. GRA

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N83-20984# Prins Maurits Lab. TNO, Rijswijk (Netherlands).
THEORETICAL AND EXPERIMENTAL EVALUATION OF AN INDOOR ROCKET TEST STAND
P. A. O. G. Korting and H. J. Reitsma Jul. 1982 51 p refs In ENGLISH; DUTCH summary
(PML-1982-27; TDCK-76868) Copyright. Avail: Issuing Activity

An indoor rocket teststand was designed to withstand an explosion of maximal 6 kg of TNT. Experimental verification with an amount of 250 g of TNT yields a strong indication that the building is indeed capable of resisting 6 kg of detonating TNT and stays within the elastic deformation region during the blast. A literature search and a calculation concerning the TNT equivalence of exploding rocket motors justifies the selected maximum 6 kg limit. Next the sound reduction aspects are treated. The building was designed to reduce the sound level of a static fired rocket motor with approximately 30 to 35 dB(A) to 70 dB(A) maximal at a distance of 200 m. Measurements during a SEA SPARROW static test revealed that a sound reduction of approximately 30 dB(A) was achieved, which is in accordance with the expectations and calculations. Finally the gas dynamical aspects of the indoor test stand are discussed. Although experimental data are not yet available the calculated data agree with data from literature. B.G.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N83-20985* National Aeronautics and Space Administration, Washington, D. C.
PRESS KIT: PROJECT RCA (SATCOM 1R)
31 Mar. 1983 8 p refs
(NASA-News-Release-83-44; P83-10055) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, Baltimore/Washington International Airport, Md. 21240 CSCL 22B

To replace the RCA SATCOM 1 satellite which provided Earth communications for seven years, NASA is to launch RCA SATCOM 1R using a Delta 3924 launch vehicle. The satellite is to be placed at 139 degrees W longitude, 35,900 kilometers (23,000) miles above the equator. On the seventh apogee, the kick motor will be fired to produce a near synchronous orbit. Satellite life, with continuous full power, is designed to be 10 years. Features of the satellite and launch operations are described. A.R.H.

N83-20986*# National Aeronautics and Space Administration, Washington, D. C.
PRELAUNCH SUMMARY NOAA-E LAUNCH
23 Mar. 1982 6 p
(NASA-CR-170097; NAS 1.26:170097; E-615-83-04) Avail: NTIS HC A02/MF A01 CSCL 22B

The NOAA-E spacecraft is described. Primary environmental sensors include the Advanced Very High Resolution Radiometer (AVHRR), the TIROS Operational Vertical Sounder (TOVS), the ARGOS Data Collection System (DCS), the Space Environment Monitor (SEM), and the Search and Rescue (SAR). Launch sequence and orbit and mission support are also discussed. Author

N83-20987*# National Aeronautics and Space Administration, Washington, D. C.
UPDATE TO THE TDRS-A MISSION OPERATION REPORT
R. E. Smylie 25 Mar. 1983 4 p
(NASA-TM-85283; NAS 1.15:85283; T-313-83-01) Avail: NTIS HC A02/MF A01 CSCL 22A

Changes in Tracking and Data Relay (TDR) satellite deployment scheduling are reported. Author

N83-20988*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT. NOAA-E
1983 24 p
(NASA-TM-85278; E-615-83-04; NAS 1.15:85278) Avail: NTIS HC A02/MF A01 CSCL 22B

The first of the advanced TIROS N spacecraft, NOAA-E has an instrument complement including a search and rescue experiment for evaluating a satellite-aided SAR system that may lead to the establishment of an operational capability. Once injected by an Atlas E launch vehicle into a 833 km (450 nautical mile) circular, near polar orbit, with an inclination of 98.7 degrees (retrograde) to the equator, the satellite is to be designated NOAA 8. The mission sequence, satellite and launch vehicle configurations and systems as well as support systems are described. A.R.H.

N83-20989*# National Aeronautics and Space Administration, Washington, D. C. Office of Space Flight.
THE RCA-F/DELTA LAUNCH
31 Mar. 1983 30 p refs
(NASA-TM-85285; NAS 1.15:85285; M-492-206-83-07) Avail: NTIS HC A03/MF A01 CSCL 22B

The Delta 3924 launch vehicle configuration which incorporates the extended long tank Thor booster, nine Castor 4 strap-on motors, the AJ-118 second stage and the TE 364-4 third stage is to place into a synchronous transfer orbit, the second in a series of

high-traffic capacity, 24 transponder communications satellites. Three days after launch, the satellite's apogee kick motor circularizes the orbit at geosynchronous altitude of 19,300 NM above the equator at approximately 128 degrees W longitude. The satellite can service commercial and government voice, digital and video communications requirements between Alaska and CONUS. The communications payload, mission requirements and spacecraft systems and subsystems are described. A.R.H.

N83-20990*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE TIME AND FREQUENCY TRANSFER (STIFT) Final Report, 1 Jun. 1980 - 31 Mar. 1983
Robert F. C. Vessot Mar. 1983 22 p refs
(Grant NsG-8006)
(NASA-CR-170160; NAS 1.26:170160) Avail: NTIS HC A02/MF A01 CSCL 22B

The concept of placing a hydrogen maser high stability clock in Earth orbit to provide accurate time and frequency comparisons worldwide to major timing centers and to a large number of radio observatory antenna sites involved in VLBI measurements was studied. The proposal was chiefly directed toward studies and initial hardware designs for time comparisons between hydrogen maser frequency standards and to modifications of the hydrogen maser for long-term use in space. Author

N83-20991*# National Aeronautics and Space Administration, Washington, D. C.
LANDSAT-D PRELAUNCH MISSION OPERATION REPORT
1982 38 p
(NASA-TM-85282; NAS 1.15:85282; E-668-82-01) Avail: NTIS HC A03/MF A01 CSCL 22B

The next generation space system to satisfy continuing requirements for timely, accurate, and reliable data on Earth resources, the LANDSAT D satellite is to be placed into sun-synchronous orbit by a Delta 3920 launch vehicle. With a 16 day repeat cycle, the entire Earth, except for an area around the poles, can be imaged. In addition to the multispectral band scanner, this satellite carries a thematic mapper instrument which produces data in seven spectral bands with significantly improved spectral, spatial, and radiometric resolution. Mission objectives, the flight mode sequence of events, and satellite and launch vehicle configurations are described. A.R.H.

N83-20992# Committee on Government Operations (U. S. House).
DIRECT BROADCAST SATELLITES: INTERNATIONAL REPRESENTATION AND DOMESTIC REGULATION
Washington GPO 1982 31 p refs Presented by the Committee on Government Operations to the Committee of the Whole House on the State of the Union, 97th Congr., 2d Sess., 12 Aug. 1982 (H-Rept-97-730; GPO-97-243) Avail: Comm. on Government Operations

The elements of both the domestic discussion of the implementation of direct broadcast satellite (DBS) services and the international debate on the cope and nature of DBS services are described. Specific issues affecting the development and deployment of DBS systems are considered. S.L.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N83-20993*# National Aeronautics and Space Administration, Washington, D. C.
STS-6 SIXTH SPACE SHUTTLE MISSION. FIRST FLIGHT OF THE CHALLENGER
Apr. 1983 56 p
(Publ-83-36) Avail: NTIS HC A04/MF A01 CSCL 22A

A prelaunch summary of the sixth Space Shuttle mission is provided. The Challenger orbiter; launching; uprated engines; lighter weight boosters; lightweight tank; external tank reduction; landing; the tracking and data relay satellite system (TDRSS), TDRS-1 deployment; the inertial upper stage (IUS), the spacewalk; electrophoresis, monodisperse latex reactor, night time/day time optical survey of lightning, and getaway special experiments are described. N.W.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N83-20994*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A STUDY OF 60 GIGAHERTZ INTERSATELLITE LINK APPLICATIONS
G. Anzic, D. J. Connolly, E. J. Haugland, H. G. Kosmahl, and J. S. Chitwood 1983 15 p refs Presented at Intern. Conf. on Commun. (ICC 1983), Boston, 19-22 Jun. 1983; sponsored by IEEE
(NASA-TM-83337; E-1467; NAS 1.15:83337) Avail: NTIS HC A02/MF A01 CSCL 09F

Applications of intersatellite links operating at 60 GHz are reviewed. Likely scenarios, ranging from transmission of moderate and high data rates over long distances to low data rates over short distances are examined. A limited parametric tradeoff is performed with system variables such as radiofrequency power, receiver noise temperature, link distance, data rate, and antenna size. Present status is discussed and projections are given for both electron tube and solid state transmitter technologies. Monolithic transmit and receive module technology, already under development at 20 to 30 GHz, is reviewed and its extension to 60 GHz, and possible applicability is discussed. Author

N83-20995*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SINGLE FREQUENCY MULTITRANSMITTER TELEMETRY SYSTEM Patent Application
Victor A. Carreno, inventor (to NASA) Filed 28 Feb. 1983 17 p
(NASA-Case-LAR-13006-1; US-Patent-Appl-SN-470113) Avail: NTIS HC A02/MF A01 CSCL 09D

The invention relates to a single frequency multitransmitter telemetry system that will deliver a substantial amount of data at low cost. The invention consists essentially of a plurality of sensor transmitter units at different locations, with individual signal conditioning and logic, which send sampled data signals to a single receiver. The transmitters operate independently on the same frequency in a frequency shift keying modulation system and are not synchronized to the receiver. The problem of reception of data from more than one transmitter simultaneously is solved by discarding the data - when there is an overlap of data from two or more transmitters, the data is discarded and when there is no overlap the data is retained. The invention utilizes a unique overlap detection technique to determine if data should be retained or discarded. When data is received from a transmitter, it goes into a shift register. NASA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N83-20996* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LASER SURFACE FUSION OF PLASMA SPRAYED CERAMIC TURBINE SEALS Patent
Donald W. Wisander and Robert C. Bill, inventors (to NASA) Issued 11 Mar. 1981 5 p Filed 11 Mar. 1981 Supersedes N81-22190 (19 - 13, p 1739)
(NASA-Case-LEW-13269-1; US-Patent-4,377,371; US-Patent-Appl-SN-242795; US-Patent-Class-415-174; US-Patent-Class-415-197) Avail: US Patent and Trademark Office CSCL 22B

The thermal shock resistance of a ceramic layer is improved. An improved abradable lining that is deposited on a shroud forming a gas path seal in turbomachinery is emphasized. Improved thermal shock resistance of a shroud is effective through the deliberate introduction of 'benign' cracks. These are microcracks which will not propagate appreciably upon exposure to the thermal shock environment in which a turbine seal must function. Laser surface fusion treatment is used to introduce these microcracks. The ceramic surface is laser scanned to form a continuous dense layer. As this cools and solidifies, shrinkage results in the formation of a very fine crack network. The presence of this deliberately introduced fine crack network precludes the formation of a catastrophic crack during thermal shock exposure.
Official Gazette of the U.S. Patent and Trademark Office

N83-20997*# Calspan Advanced Technology Center, Buffalo, N.Y.
A STUDY OF AERODYNAMIC HEATING DISTRIBUTIONS ON A TIP-FIN CONTROLLER INSTALLED ON A SPACE SHUTTLE ORBITER MODEL Final Report
Charles E. Wittliff Aug. 1982 102 p refs
(Contract NAS1-16618)
(NASA-CR-166025; NAS 1.26:166025; Rept-6912-A-2) Avail: NTIS HC A06/MF A01 CSCL 22B

The aerodynamic heating of a tip-fin controller mounted on a Space Shuttle Orbiter model was studied experimentally in the Calspan Advanced Technology Center 96 inch Hypersonic Shock Tunnel. A 0.0175 scale model was tested at Mach numbers from 10 to 17.5 at angles of attack typical of a shuttle entry. The study was conducted in two phases. In phase 1 testing a thermographic phosphor technique was used to qualitatively determine the areas of high heat-transfer rates. Based on the results of this phase, the model was instrumented with 40 thin-film resistance thermometers to obtain quantitative measurements of the aerodynamic heating. The results of the phase 2 testing indicate that the highest heating rates, which occur on the leading edge of the tip-fin controller, are very sensitive to angle of attack for alpha < or = 30 deg. The shock wave from the leading edge of the orbiter wing impinges on the leading edge of the tip-fin controller resulting in peak values of h/h(Ref) in the range from 1.5 to 2.0. Away from the leading edge, the heat-transfer rates never exceed h/h(Ref) = 0.25 when the control surface, is not deflected. With the control surface deflected 20 deg, the heat-transfer rates had a maximum value of h/h(Ref) = 0.3. The heating rates are quite nonuniform over the outboard surface and are sensitive to angle of attack. Author

N83-20998*# National Aeronautics and Space Administration, Washington, D. C.
SALYUT-7
A. Aleksandrov Dec. 1982 8 p Transl. into ENGLISH from Aviat. Kosmonavt. (USSR), no. 9, Sep. 1982 p 44-45 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77177; NAS 1.15:77177) Copyright. Avail: NTIS HC A02/MF A01 CSCL 22B

The differences between the orbital scientific station 'Salyut-7' and 'Salyut-6' are discussed. It is noted that the greatest changes have occurred in the scientific instrument compartment. The changes in the food supplied to the cosmonauts are also described. Author

N83-20999*# Toronto Univ. (Ontario). Dept. of Electrical Engineering.
ELECTRON BEAM CHARGING AND ARC DISCHARGING OF SPACECRAFT INSULATING MATERIALS Semiannual Status Report
K. G. Balmain Mar. 1983 19 p refs Sponsored in part by AFWL
(Grant NsG-7647)
(NASA-CR-170161; NAS 1.26:170161) Avail: NTIS HC A02/MF A01 CSCL 22B

Samples of Mylar and Teflon film were exposed to combinations of monoenergetic electron and lithium ion fluxes in various ratios. The samples' discharge rates and strengths were found to diminish as the ion proportion increased. Various types of capacitors were exposed in air to beta irradiation from a 100 mCie Strontium-90 radioisotope source located at distances ranging from 2 cm to 5 cm from the capacitors. In these preliminary experiments, no evidence of spontaneous electrical breakdown was noted, nor was any change in RF impedance detectable using the available instrumentation. A decrease in DC resistance was noted, apparently due to radiation-induced conductivity. A cylindrical glass vacuum chamber is being assembled. Its inside dimensions are 44 cm diameter by 100 cm length. All necessary associated components and instruments have been acquired, including electron and ion guns, Trek surface potential probe and turbo-molecular pump. A mass-spectrometer detector for leaks and evolved gases will be ordered shortly. Author

N83-21000# Aeritalia S.p.A., Torino (Italy).
OPTIMIZATION OF JOINTS TECHNOLOGY FOR LARGE SPACE PLATFORMS Final Report
G. DEmiliano and E. Turci Paris ESA 30 Apr. 1981 345 p refs
(Contract ESTEC-3958/79/NL-AK)
(JO-RP-AI-001; ESA-CR(P)-1644) Avail: NTIS HC A15/MF A01

A joint system to be used as the interfacing element in the integration in low Earth orbit of preassemble module structures to form an orbiting platform is discussed. A total of requirements for such a joint as can be predicted, from a knowledge of a proposed platform configuration, its performance requirements and the total known or assumed environment on the platform and its component modules in all stages of assembly, as these affect the joint is developed. S.L.

N83-21001# Contraves Corp., Zurich (Switzerland).
STUDY ON LARGE, ULTRA-LIGHT, LONG-LIFE STRUCTURES IN SPACE, PHASE 2 Final Report
M. C. Bernasconi, C. F. vanMansvelt, J. P. Schwander, and K. J. Zimmermann Paris ESA Jul. 1982 215 p refs
(Contract ESTEC-4023/79/NL-AK)
(TM-EKR3; ESA-CR(P)-1664) Avail: NTIS HC A10/MF A01

The feasibility of inflatable, space rigidized structures (ISRS) was positively assessed and a reference object - a 10 m antenna reflector was designed and subjected to a preliminary analysis. The wall of such a chemically rigidizing object is a thin, fiber reinforced composite lamina. The search for suitable matrix resins and their characterization and improvement program is discussed. For the reinforcement, a lightweight KEVLAR cloth was chosen - mainly for thermostability reasons. The selected matrix is an imide modified, catalytically cured, cycloaliphatic epoxy resin, which can be cured either thermally or by an external gaseous catalyst. The area mass of the resulting composite wall - including a plastic foil gas barrier - is of the order of 0.1 kg/m2 sq m. The materials

were subjected to an extensive series of tests, including: thermal cycling, charging, simulated solar exposure, 1 year storage stability and 4 year thermal aging. S.L.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N83-21002*# Martin Marietta Aerospace, Denver, Colo.
STUDY FOR ANALYSIS OF BENEFIT VERSUS COST OF LOW THRUST PROPULSION SYSTEM Final Report, Nov. 1982 - Feb. 1983
K. M. Hamlyn, R. I. Robertson, and L. J. Rose Mar. 1983 154 p refs
(Contract NAS3-23246)
(NASA-CR-168011; NAS 1.26:168011; MCR-82-521) Avail: NTIS HC A08/MF A01 CSCL 21H

The benefits and costs associated with placing large space systems (LSS) in operational orbits were investigated, and a flexible computer model for analyzing these benefits and costs was developed. A mission model for LSS was identified that included both NASA/Commercial and DOD missions. This model included a total of 68 STS launches for the NASA/Commercial missions and 202 launches for the DOD missions. The mission catalog was of sufficient depth to define the structure type, mass and acceleration limits of each LSS. Conceptual primary propulsion stages (PPS) designs for orbital transfer were developed for three low thrust LO2/LH2 engines baselined for the study. The performance characteristics for each of these PPS was compared to the LSS mission catalog to create a mission capture. The costs involved in placing the LSS in their operational orbits were identified. The two primary costs were that of the PPS and of the STS launch. The cost of the LSS was not included as it is not a function of the PPS performance. The basic relationships and algorithms that could be used to describe the costs were established. The benefit criteria for the mission model were also defined. These included mission capture, reliability, technical risk, development time, and growth potential. Rating guidelines were established for each parameter. For flexibility, each parameter is assigned a weighting factor. S.L.

N83-21003# Societe Europeenne de Propulsion, Vernon (France). Dept. Espace.
FIELD EMISSION ELECTRIC PROPULSION THEORETICAL AND EXPERIMENTAL STUDY OF THE SURFACE TREATMENT TO BE APPLIED ON FIELD EMITTER. Final Report
J. P. Bugeat and D. Valentian Paris ESA 10 Dec. 1980 183 p refs
(Contract ESTEC-3805/78/NL-JS)
(SEP-TS/SL/340/JPB/30.664/80; ESA-CR(P)-1654) Avail: NTIS HC A09/MF A01

Convenient nonwetting coatings for the cesium emitters of field emission thrusters were studied, selected, and tested in an effort to reduce the neutral rate. the interlectrodes current, and the beam divergence. An increased intensity stability was also sought. Topics covered include determining both the physical and engineering properties of coatings and establishing selection criteria related to the compatibility of coating and emitter material and environment. A.R.H.

N83-21004# Societe Europeenne de Propulsion, Vernon (France). Energy Propulsion Industry.
FIELD EMISSION ELECTRIC PROPULSION. INDUSTRIAL DEVELOPMENT OF EMITTER MODULES, PHASE 1, VOLUME 1 Final Report
J. P. Bugeat and D. Valentian Paris ESA 22 Oct. 1980 144 p 2 Vol.
(Contract ESTEC-3724/78/NL-JS)
(TS/SL/340/DV/30.561/80-Vol-1; ESA-CR(P)-1681-Vol-1) Avail: NTIS HC A07/MF A01

Emitter modules were tested in environmental conditions closely simulating a real thruster operation (minimum walls effects). The test facility used to test the emitter is described. It includes a big vacuum chamber with a hatch which reduces pumping time and some stand-by operations. The facility also includes command and control electronics with growing capability to a fully automated system allowing long duration testing. The measurement system includes wire probes and faraday cups for beam diagnostic, balance for flowrate measurements. The laboratory thruster is designed to offer a maximum flexibility and is studied as a modular device. In order to avoid frequent return to atmospheric pressure and associated cleaning, the emitter-accelerating electrode distance can be altered under vacuum. Another prominent feature of the thruster is the ability to change the positive pressure under high voltage and during thruster operation. S.L.

N83-21005# Societe Europeenne de Propulsion, Vernon (France). Energy Propulsion Industry.
FIELD EMISSION ELECTRIC PROPULSION. INDUSTRIAL DEVELOPMENT OF EMITTER MODULES, PHASE 1, VOLUME 2 Final Report
J. P. Bugeat and D. Valentian Paris ESA 17 Nov. 1980 169 p 2 Vol.
(Contract ESTEC-3724/78/NL-JS)
(TS/SL/340/DV/30.561/80-Vol-2; ESA-CR(P)-1681-Vol-2) Avail: NTIS HC A08/MF A01

The tests of emitter modules used for field emission thrusters and the facility built for the tests are described. The facility includes a 4.5 cu m vacuum chamber with airlock, a measurement and control electronics accommodated in four standard enclosures and beam diagnostic probes. The laboratory thruster used is weighed. This allows measurement of the cesium flow consumption, and delivers a cesium pressure adjustable between -2 and +20 millibar. Emitter/accelerating electrode distance can be adjusted during operation. The whole system can sustain +15 Kilovolts and -6 KV on emitter and accelerating electrode respectively. S.L.

N83-21006# European Space Agency, Paris (France).
FOURTH ESTEC SPACECRAFT POWER-CONDITIONING SEMINAR
B. Battrick, comp. and E. Rolfe, comp. Sep. 1982 192 p refs Partly in ENGLISH and FRENCH Proc. of Intern. Sem., Noorwijk, Netherlands, 9-11 Nov. 1982
(ESA-SP-186; ISSN-0379-6566) Avail: NTIS HC A09/MF A01

Payload and system interfaces; original regulator/converter concepts; application of new techniques/technologies; power conditioning, energy storage and auxiliary electronics; and analysis and modelling are discussed. For individual titles, see N83-21007 through N83-21030.

N83-21007# AEG-Telefunken, Wedel (West Germany).
ELECTRICAL POWER SYSTEMS FOR LOW EARTH ORBITS
G. Eggers *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 1-10 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

Low Earth orbit space missions will be characterized by power demands in the multi-kW range for the near- and several 10 kW

for the far future. They will be required to maintain the full payload power demand during eclipse phases. In nearly all cases, the power sources will be Solar Array and Batteries. The power conditioning engineering is therefore faced with the task of developing suitable power conditioning systems to meet both these new requirements together with the demands of space-related systems such as high reliability, high efficiency, low mass, and volume etc. Different power system configurations are compared with the aim of selecting the most promising concept. Author

N83-21008# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
THE MARECS/ECS POWER SUBSYSTEM
J. E. Haines *In* ESA 4th ESC Spacecraft Power-Conditioning Seminar Sep. 1982 p 11-20 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The description of a power subsystem concept that will be used with minimal modification on a series of seven communications spacecraft is presented. The subsystem is comprised of a dual wing rigid deployable panel solar array, two nickel cadmium batteries and attendant power conditioning and control equipment. A special feature of the subsystem is the shunt regulator which maintains bus voltage regulation by sequentially switching electrical sections of the solar array. Also presented are the performance parameters achieved with this subsystem and the operational modes utilised during flight. Author

N83-21009# Engins Matra, Toulouse (France).
SIMULATION OF THE BEHAVIOR OF THE TELECOM 1 SATELLITE INPUT CIRCUITS IN AMRT MODE [SIMULATION DU COMPORTEMENT DE LA BARRE D'ALIMENTATION DU SATELLITE TELECOM 1 EN MODE AMRT]
H. Barde *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 21-25 In FRENCH (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

Operation in the time division multiple access mode of the carrying capacity of the TELECOM 1 satellite, whose feeding is not regulated, required simulation of the phenomenon of current reinjection by the EPC at the time of modulation interruption. A network of 200 nodes and 300 components having numerous nonlinear elements was tested using the ISPICE program for the numerical simulation of electric networks. The results obtained were validated by incomplete tests and permit prediction of the nominal operation of the useful load, even in the worst case envisioned. Research at the satellite level can confirm this fact and allow comparison with results calculated in this manner.
Transl. by A.R.H.

N83-21010# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
THE L-SAT POWER SUBSYSTEM
R. B. A. Harris *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 27-31 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

A description of the power subsystem for the L-SAT platform is given. The system design features a modular concept so that a wide range of payload power requirements for L-SAT satellites can be met from a standard set of hardware by straightforward selection. The design of the power subsystem is based on that used in the ECS/MARECS range of satellites, but some new concepts are introduced. These include the use of nickel hydrogen batteries, and an a.c. distribution system for auxiliary and low power supplies both in the platform and payload. The power system is designed for high power missions, reflecting the capabilities of L-SAT, being extendible to power missions of up to 7.0 kW payload in sunlight and 2.5 kW in eclipse. Author

N83-21011# Technical Univ. of Budapest (Hungary).
NEAR-OPTIMUM DYNAMIC PERFORMANCE OF SWITCHING-MODE POWER CONVERTERS USING FEED-FORWARD OF OUTPUT CURRENT AND INPUT VOLTAGE WITH CURRENT-MODE CONTROL
Richard Redl and Nathan O. Sokal (Design Automation Inc.) *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 33-42 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

Near-optimum dynamic performance of a switching-mode power converter is obtained with very simple hardware by adding feed-forward of output current and input voltage to a current-mode control system. One obtains near-zero output impedance and audio susceptibility over the frequency range from dc to nearly the operating frequency, and a large reduction in the magnitude and duration of the transient disturbance of output voltage resulting from a transient change of output current or input voltage. The method is applicable to both forward and flyback types of converters, and to all types of current-mode control. The control loop, conditions to achieve extremely good transient response, calculation of the peak deviation of the output voltage for a step load change, practical methods for current feed-forward, and experimental results are described. Author

N83-21012# European Space Agency, Toulouse (France).
SINE WAVE HIGH POWER INVERTER USING CURRENT CONTROLLED MODULATION
A. Capel, J. Jalade (Lab. d'Automatique et d'Anal. des Systemes), M. Valentin (Lab. d'Automatique et d'Anal. Des Systemes), and J. C. Marpinard (Lab. d'Automatique et d'Anal. des Systemes) *In its* 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 43-50 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The application of a modulator controlling a buck power stage to achieve an AC waveform at 50 Hz, from a DC input of 40 Volt is described. Large signal dynamic stability analysis has to be performed by using an analog computer facility which has led to the insertion of a corrective network in the modulator design. These studies are detailed in a first part leading to a small signal model which can be applicable to these types of applications subject to the sine wave frequency is lower than the slowest frequence response in the operating point range of the regulator. Author

N83-21013# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
TWT AMPLIFIER DEVELOPMENT FOR ACTIVE MICROWAVE INSTRUMENTS
Philipp Sopper *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 51-59 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The TWT-Amplifiers described are used in spaceborne radar instruments or the generation of high pulsed RF power. Two developments with 3 KW and 5 KW peak RF-power are presented. The TWT's able to deliver these values have to be supplied with different high voltages up to 10 KV and 15 KV resp. The main development problems of the equipments are the handling of high voltages in space environment, the conversion of high pulsed and average power, the provision of grid modulation as well as the tube control and protection. Author

N83-21014# Etudes Techniques et Constructions Aerospatiales, Charleroi (Belgium).
LOAD PROTECTION BY FUSES AND ITS IMPACT ON THE POWER SUBSYSTEM DESIGN
Y. Ermurat and G. Merveille *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 61-65 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

Not used during a long time, the fuse protection concept appears now on different heavy satellites. A brief trade off study, exemplied by METEOSAT and EXOSAT, will clearly show that if the bus loads are protected by fuses, the volume of the power subsystem units can be drastically reduced. The feasibility of the concept is demonstrated by the presentation of the most critical parts of the subsystem: the battery discharger and the convert-

ers. Design, detailed performances, problem areas, modulerization, practical realization are presented.

N83-21015# Christian Rovsing Ltd., Copenhagen (Denmark).
APPLICATION OF POWER FET TRANSISTORS IN BUCK REGULATOR
F. H. Pedersen *In* ESA 4th ESTEC Spacecraft Power Conditioning Seminar Sep. 1982 p 67-71 (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

A Buck-regulator implemented with N-channel power MOSFET transistors is described. The Buck regulator has a high power conversion efficiency. This is obtained by replacing the free-wheel diodes with switched power MOSFET transistors. Author

N83-21016# Terma Elektronisk Industri A/S, Lystrup (Denmark).
THE APC, A BASIS FOR A POWER CONTROL UNIT USING MICROPROCESSORS
Nis Adelby Clausen *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 73-79 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The hardware and software currently being developed for the APC (Advanced Power Controller), and experimental microprocessor based unit intended to be applied in a spacecraft power subsystem are covered. Prior to the description of the APC hardware some of the major design goals and considerations concerning redundancy are put down. A functional description of the various modules are given, followed by a description of the software system for the APC. The possible application for an APC unit are discussed. Author

N83-21017# Fabrica Italiana Apparecchi Radio S.p.A., Milan (Italy).
RECOVERY CHOKE IN PARALLEL CONFIGURATIONS
D. DiCesare *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 81-85 (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

An application of the recovery choke in parallel configuration, designed to reduce the voltage spike in a push-pull converter and to recover the energy normally dissipated in a RC snubber network, is described. The proposed solution permits the power loss reduction to the snubber effect. Author

N83-21018# Fabrica Italiana Apparecchi Radio S.p.A., Milan (Italy).
BOOST LC3 AT VARIABLE CONSTANT
D. DiCesare and M. Gambarara *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 87-90 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The LC(3) boost is a circuit that performs the voltage regulation in a form of conductance control, with the transfer characteristic of a first order function. This boost keeps this characteristic in free running mode changing the switching frequency when the input voltage value changes. The LC(4) V boost maintains the same characteristic of the LC(3) V boost even keeping constant the switching frequency. M.G.

N83-21019# AEG-Telefunken, Backnang (West Germany).
HIGH VOLTAGE TESTING AND PACKAGING
Klaus H. Geissler *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 91-96 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The problem of high voltage testing of completely integrated traveling wave tube amplifiers is analysed. A test setup that has worked successfully to identify the cause of one type of spurious switchoff is described. The difficulties such a test setup has to cope with are discussed. Changes of HV-circuit and packaging as required for advanced testing methods are introduced. M.G.

N83-21020# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Aerospace Dept.
STATUS OF EUROPEAN NICKEL-HYDROGEN BATTERY DEVELOPMENT
P. Gojat *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 97-101 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The development of nickel-hydrogen battery technology for geosynchronous satellites is discussed. The major development activities of nickel hydrogen technology involve both cell and battery. Cycle life test results demonstrating more than 10 years of accelerated operation with depth of discharge up to 90% are presented. The battery design is a flexible one able to embody about 30 cells within the range of rated capacity of from 30 to 60 Ah. Presently two batteries comprising 28 SAFT HRN 42 S type cells (50 Ah/measured) are under development and fabrication. An engineering model and a qualification model were developed to establish and confirm the new battery concepts necessary to assemble a nickel-hydrogen battery with a particular interest for the specificity of the nickel-hydrogen cell interfaces (cylindrical shape, pressure vessel, thermal and electrical interfaces). M.G.

N83-21021# Engins Matra, Toulouse (France).
ENERGY GENERATING AND STORING METHOD FOR SPACE APPLICATION [METHODE DE GENERATION ET DE STOCKAGE D'ENERGIE POUR L'APPLICATION SPATIALE]
Y. Dubois *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 103-114 refs In FRENCH (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The state of the art of lithium batteries is described as well as a system for energy storage based on the use of a fuel cell plus an electrolyzer. Increased performance of lithium batteries gives this type of energy source numerous potential applications in the space domain. They constitute an irreplaceable energy source for interplanetary probes and can permit a substantial gain in mass for launch vehicles. Important progress realized with fuel cells makes the fuel cell-electrolyzer system particularly attractive for low orbit applications. The performance of the battery plus electrolyzer is analyzed and used to show the superiority of this system with respect to a system with Ni/Cd batteries.
Transl. by A.R.H.

N83-21022*# National Advisory Committee for Aeronautics. Lewis Flight Propulsion Lab., Cleveland, Ohio.
NICKEL-HYDROGEN BIPOLAR BATTERY SYSTEM
Lawrence H. Thaller *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 115-121 refs Previously announced as N82-30716 (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01 CSCL 10C

Rechargeable nickel-hydrogen systems are described that more closely resemble a fuel cell system than a traditional nickel-cadmium battery pack. This was stimulated by the currently emerging requirements related to large manned and unmanned low Earth orbit applications. The resultant nickel-hydrogen battery system should have a number of features that would lead to improved reliability, reduced costs as well as superior energy density and cycle lives as compared to battery systems constructed from the current state-of-the-art nickel-hydrogen individual pressure vessel cells. M.G.

N83-21023# Eagle-Picher Industries, Inc., Joplin, Mo.
A HIGH ENERGY-DENSITY NICKEL-HYDROGEN BATTERY DESIGN
Lee Miller *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 123-127 (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

A light-weight Ni-H2 battery design concept (projected energy-density 46.7 Whr/Kg or 21.2 Whr/Lb) suitable for immediate or near-term spacecraft integration is described. The proposed design does not violate proven and qualified design concepts, or critical electrochemical component designs or functions. M.G.

N83-21024*# National Advisory Committee for Aeronautics. Lewis Flight Propulsion Lab., Cleveland, Ohio.
SYNTHETIC BATTERY CYCLING TECHNIQUES
Harold Leibecki and Lawrence H. Thaller *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 129-134 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01 CSCL 10C

The group of techniques that as a class are referred to as synthetic battery cycling are described with reference to spacecraft battery systems. Synthetic battery cycling makes use of the capability of computer graphics to illustrate some of the basic characteristics of operation of individual electrodes within an operating electrochemical cell. It can also simulate the operation of an entire string of cells that are used as the energy storage subsystem of a power system. M.G.

N83-21025# Engins Matra, Toulouse (France).
EQUIVALENT ELECTRIC MODEL OF AN STORAGE BATTERY FOR COMPUTERIZED SIMULATION [MODELE ELECTRIQUE EQUIVALEWNT D'ACCUMUMATEUR POUR SIMULATION PAR CALCULATOR]
Y. Dubois *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 135-142 refs In FRENCH (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

Electric and thermal models are described for storage batteries for space applications. Results obtained using the models are compared with test results and their reliabilities are validated. The structure of the model permits rapid adaptation for different types of batteries and usages, by means of interactive language. The model served to elaborate the complete model of the electric feed subsystem for the ERS-1 satellite. Transl. by A.R.H.

N83-21026# Engins Matra, Toulouse (France).
AID IN THE DESIGN OF A POWER SYSTEM BY A SIMULATION SOFTWARE: EBLOS [AIDE A LA CONCEPTION D'UN SYSTEME DE PUISSANCE PAR UN LOGICIEL DE SIMULATION: EBLOS]
J. Cornet, J. G. Ferrante, and A. Capel *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 143-156 refs In FRENCH (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

A program for the dynamic simulation of a power system was developed which permits the determination of mission profiles while assuring compatibility with the performance of the power system. The program was applied to the ERS-1 satellite, notably to the electrical and thermal modelings of a solar generator and NiCd storage batteries. Simulation results were smoothed on experimental measurements. The EBLOS program for simulating the energy balance of a low orbit satellite, was developed in a modular fashion and offers the user a flexible language for inputs/outputs.
Transl. by A.R.H.

N83-21027# Centre National d'Etudes Spatiales, Toulouse (France).
AUTOMATIC METHOD FOR MODELING AND DIMENSIONING CONVERTORS [METHODE AUTOMATIQUE DE MODELISATION ET DE DIMENSIONNEMENT DES CONVERTISSEURS]
A. Barnaba *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 157-164 refs In FRENCH (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

A desktop computer is used for modeling and sizing dc to dc converters. Modeling comprises principally frequential analysis in the Bode diagram as a function of the components chosen as well as its study as a function of the constraints imposed upon them. Dimensionning is effected with components found on preferential lists whose characteristics are stated by the manufacturers or the bodies which qualified them. Actual limits are given and the paths are described towards which efforts should be made undertaken with a view to improving the power per unit of mass.
Transl. by A.R.H.

N83-21028*# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER DC-TO-DC CONVERTERS **c33**
Thomas G. Wilson, Harry A. Owen, and Paul M. Wilson *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 167-173 refs Presented at US-Japan Cooperative Sci. Sem. on Anal. and Design in Power Electron. 1981, Kobe, Japan, Nov. 1981 (For primary document see N83-21006 11-20)
(Grant NsG-3157)
Avail: NTIS HC A09/MF A01

A simple analysis of the current and voltage waveshapes associated with the power transistor and the power diode in an example current-or-voltage step-up (buck-boost) converter is presented. The purpose of the analysis is to provide an overview of the problems and design trade-offs which must be addressed as high-power high-voltage converters are operated at switching frequencies in the range of 100 kHz and beyond. Although the analysis focuses on the current-or-voltage step-up converter as the vehicle for discussion, the basic principles presented are applicable to other converter topologies as well. Author

N83-21029# Crouzet Aerospace and Systems, Valence (France).
STATIC RELAY WITH A THERMAL PROTECTION **c33**
F. Fachinetti and C. Neveu *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 175-181 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The principle and the design of a static relay using a power FET as switch function and able to replace electromechanical relays and fuses usually used on spacecraft power lines are described. This device enables a full protection of the power sources and includes a self thermal protection based on a thermal-electrical analogy which permits the calculation and limitation of the FET temperature both in static state and during transient state. The description and the test results of a breadboard are given and the final characteristics of the product which will be built in thick film technology are presented. M.G.

N83-21030# Fabrica Italiana Apparecchi Radio S.p.A., Milan (Italy).
THE 20 W R.F. HEXFET EPC DESIGN **c33**
P. Leoni *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 183-186 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

The design concept, the technology, and the test results of an EPC for traveling wave tubes in the range of 10 to 30 W RF are presented. The EPC is characterized by high flexibility, low weight, and the capability to supply TWT's with different levels of power and voltage. M.G.

N83-21031# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
SOLID ROCKET AND SPACE PROPULSION STUDIES Annual Report, 1 Oct. 1981 - 30 Sep. 1982
R. L. Glick and J. R. Osborn Nov. 1982 19 p refs
(Grant AF-AFOSR-0025-82; AF Proj. 2308)
(AD-A122239; AFOSR-82-1039TR) Avail: NTIS HC A02/MF A01 CSCL 21/9

This research was concerned with four rocket related topics: forced longitudinal wave mortors, nonsteady burning in randomly layered media, insitu burning rate measurements, and thermal protection systems for radiant energy deposition powered thrustors. Apparatus for the forced longitudinal wave motor procured from Princeton, a test cell was readied and pressure instrumentation purchased. In addition, preliminary theoretical and flow visualization studies were conducted. The latter showed the following: (1) when port Mach number is not small, both response and admittance functions enter as unknowns, and (2) port and near burning surface flows are not in phase so that periodically inflected velocity profiles accompany axial mode oscillations. Nonsteady burning studies showed that extinguishments can occur in fine particle psuedo propellant to course propellant psuedo propellant transitions and

that the constant pressure burning rate auto-spectra contains resonance at the layer frequencies, twice layer frequencies, and characteristic frequencies; previous models assumed resonances solely at the layer frequencies. GRA

N83-21032# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA ARMAMENTARII (SELECTED ARTICLES)
Junyang Luo, Yue Sun, Junhua Wan, and Xieqi Ma 1 Dec. 1982 63 p refs Transl. into ENGLISH from Binggong Xuebac (China), no. 1, Feb. 1982 p 1-9 and 38-57
(AD-A122786; FTD-ID(RS)T-0801-82) Avail: NTIS HC A04/MF A01 CSCL 21/9

Three articles on combustible flow were presented. The pontryagin maximum principle was used to study the optimal nozzle surface for one dimensional two phase flows. A simplified calculational method for solving the equilibrium composition of the combustion products of composite propellants was presented. The plateau combustion mechanism of double base propellants was reviewed. B.G.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N83-21033# Internationale Dokumentationsgesellschaft fuer Chemie m.b.H., Frankfurt am Main (West Germany). Datenverarbeitung und Entwicklung.
CRT DISPLAY OF CHEMICAL STRUCTURES: INPUT AND IMAGE TRANSMISSION Final Report, Jun. 1982
Hans- Stefan Neubert and Dieter Schumacher Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 44 p refs In GERMAN; ENGLISH summary Sponsored by Forschung und Technologie
(BMDT-FB-ID-82-010; ISSN-0170-8996) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,50

The input and screen presentation of chemical structures are described. A function keyboard serves as the input medium. A subset of the used command language is suitable as a transmission code for these structure images. High information density allows the structure transmission also by slow process (means).
Author (ESA)

N83-21034*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYNTHESIS AND THERMAL STABILITY OF CARBORANE CONTAINING PHOSPHAZENES
L. L. Fewell, R. J. Basi (San Jose State Univ.), and J. A. Parker Mar. 1983 33 p refs
(NASA-TM-84341; A-9190; NAS 1.15:84341) Avail: NTIS HC A03/MF A01 CSCL 07A

Carborane substituted polyphosphazenes were prepared by the thermal polymerization of phenyl-carboranyl penta chlorocyclotriphosphazene. Successive isothermal vacuum pyrolyses were conducted on the polymer and examined for structural changes by infrared spectroscopy. The degradation products were ascertained by gas chromatography-mass spectrometric analysis. It was found that the presence of the carborane group improves the thermal stability of the polymer by retarding the ring chain equilibrium processes of decomposition. Author

N83-21035# Naval Research Lab., Washington, D. C. Off-Board Countermeasures Branch.
COMPUTER-CONTROLLED APPARATUS FOR THE MEASUREMENT OF THE NORMAL SPECTRAL EMISSIVITY OF MATERIALS Interim Report
J. A. LaFemina and W. E. Howell 29 Nov. 1982 26 p refs (XF34372)
(AD-A122378; NRL-MR-4972) Avail: NTIS HC A03/MF A01 CSCL 20/3

A need exists for the measurement of the thermal radiative properties of materials, especially in the infrared region of the electromagnetic spectrum at moderate to high temperatures. To meet this need, an automated apparatus for the measurement of the normal spectral emissivity from 2-15 microns in the temperature range of 500 C to incandescence has been designed, fabricated and tested. The integral blockbody method was chosen whereby a metallic foil or ribbon is formed into a tube shape and is heated by the passage of direct current. The system is described, and sources of error are briefly outlined. Most materials used in engineering systems do not have atomically clean surfaces but come with 'as is' surfaces. Hence, one needs to investigate the radiative properties of these real surfaces. Results of the measurement of the normal spectral emissivity of an 'as is' tungsten surface from 2-6 microns at 700 C and 900 C are given. The present data is compared with literature values on annealed tungsten samples. These results demonstrate that the present system functions properly and will provide a valuable tool for the rapid assessment of the emissive properties of materials. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N83-21036# Battelle Inst., Frankfurt am Main (West Germany).
RESEARCH AND DEVELOPMENT WORK RELATING TO POSSIBILITIES OF PREPARING FIBROUS DUSTS WITH DEFINED FIBER DIAMETER RANGES Final Report, Mar. 1981
Eva Poeschel and Ulrich Roth Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 50 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-NA-82-033; R-63-511; ISSN-0171-7618) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Ger. DM 10,50

The investigation was aimed at methods which are feasible in principle for preparing model fibrous dusts. Such dusts are urgently needed for inhalation toxicological investigations with the objective of determining whether fibrous materials other than asbestos have harmful effects similar to those of asbestos. Two methods were evaluated: in one case the fibers were extracted from commercial mineral and slag wools, and in the other they were prepared from textile glass fibers by reduction of the diameter. Both methods are practicable. In addition, an evaluation of the costs for preparing such model fibers was made, assuming that an optimized method of production exists. The investigation is to be regarded as a feasibility study. On the basis of results of this investigation, the production method will have to be developed which is suitable for preparing the amounts of model fibrous dusts necessary for experiments on animals; this means that the invidual steps for the production method will have to be optimized with respect to yield and selectivity. Author (ESA)

N83-21037# Bayer A.G., Krefeld (West Germany). Zentralbereich Forschung und Entwicklung.
PRESERVATION AND PROCESSING OF WOOD BY MEANS OF ORGANIC REACTIVE SYSTEMS Final Report, Dec. 1980
Helmut Ritter Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 17 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-200; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karsruhe, West Germany DM 3,50

A permanent protection of wood against weather and biological parasites is investigated. The environmental influences caused by application of wood preservatives have to be kept to a minimum. According to this, systems which have perhaps a lower toxicity, a lower vapor pressure, and an improved resistance against extraction were developed. Reactive components, which give

covalent bonds to the wooden materials, and an oligomer system were studied. Hydrophobizing of wood by blocking the OH rests results in products, which have drastically improved biological and mechanical properties. The procedure however is very expensive. Under mild conditions, the covalent bonding of active substrates to the wood is not possible to a sufficient extent. However, the penetration of high molecular substrates into the wood is sufficient to guarantee permanent protection. Therefore oligomer reactive components (sulfenic acid amides) were synthesized. These products with raised molecular weight have a lower vapor pressure and an extended effectiveness compared with the monomeric substrates. S.L.

N83-21038# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
INVESTIGATIONS IN FLAW SPREADING AND RESIDUAL STABILITY OF CFK LAMINATES Final Report, Jul. 31, 1981 [SCHADENSAUSBREITUNGS- UND RESTFESTIGKEITSUNTERSUCHUNGEN AN CFK-LAMINATEN]
Heimo Huth, Otto Peter, and Dieter Schuetz Bonn Bundesministerium ver Verteidigung 1982 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium ver Verteidigung
(BMVG-FBWT-82-5; LBF-3976/2) Avail: NTIS HC A03/MF A01; DOKZENTBw, Bonn DM 30

Delamination in graphite/epoxy laminates can be monitored by ultrasonic inspection techniques such as the impuls-echo C-scan method. It is of interest to gain knowledge about the behavior of such defects under cyclic loading in order to define inspection intervals. The behavior of different types of laminates was studied to get information about the mechanisms effecting delamination growth. The influence of damage in terms of defect size and change of stiffness on the residual strength was determined. It is shown that the delamination growth depends on the stacking sequence of the laminate and on the location of the delamination. The sensitivity of a laminate for the formation of edge-delaminations also depends on its lay up. This behavior can be predicted using known and rather simple analytical models. A.R.H.

N83-21039*# National Aeronautics and Space Administration, Washington, D. C.
A STUDY OF THE STRUCTURE AND PROPERTIES OF CERTAIN ALUMINIDES
M. Ye. Drits, E. S. Kadaner, and A. A. Vashchenko Dec. 1982 12 p refs Transl. into ENGLISH from the book "Legkie Splavy i Metody Ikh Obrabotki" Moscow, Nauka Press, 1968 p 146-150 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77007; NAS 1.15:77007) Avail: NTIS HC A02/MF A01 CSCL 11D

Experimental data are presented on the structure and heat resistance of the aluminides ZrAl3, Fe2Al5 and Co2Al9, considering sp. wt., type of combination, and resistance to oxidation at high temperatures. Co2Al9 possesses a relatively high heat of formation, attributed to its high heat resistance characteristics. S.L.

N83-21040*# National Aeronautics and Space Administration, Washington, D. C.
CHARACTERIZATION OF BORON CARBIDE WITH AN ELECTRON MICROPROBE
G. Matteudi and J. Ruste Feb. 1983 15 p refs Transl. into ENGLISH from Rev. Phys. Appl. (France), v. 8, Mar. 1973 p 27-32 Previously announced in IAA as A73-28346 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77028; NAS 1.15:77028) Avail: NTIS HC A02/MF A01 CSCL 11D

Within the framework of a study of heterogeneous materials (Matteudi et al., 1971: Matteudi and Verchery, 1972) thin deposits of boron carbide were characterized. Experiments using an electronic probe microanalyzer to analyze solid boron carbide or boron carbide in the form of thick deposits are described. Quantitative results on boron and carbon are very close to those obtained when applying the Monte Carlo-type correction calculations. F.R.L. (IAA)

N83-21041# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
STANDARDIZATION PROGRAM ON DESIGN ANALYSIS AND TESTING OF INSERTS. VARIATION OF SANDWICH CORE PROPERTIES Final Report
W. Paul and D. Wagner Paris ESA 13 Dec. 1981 126 p refs (Contract ESTEC-3442/77/NL-PP)
(ERN-3442/77-31; ESA-CR(P)-1665) Avail: NTIS HC A07/MF A01

The relation of the largely differing strength properties of honeycomb core to insert strength was investigated to determine the relevance of core shear strength to insert performance. Potting strength was also considered with respect to the assurance of adequate bonding to the insert element. Results show that the variation of the core density (+ or - 10 %) is major source of core strength variability. There is evidence that the strength of foil material is also significantly influencing the core strength properties. The perforation is found as source of degradation of foil strength, though the standards do not distinguish between perforated and nonperforated core. A.R.H.

N83-21042# Naval Ship Research and Development Center, Bethesda, Md. Ship Materials Engineering Dept.
FIBER OPTIC DAMAGE ASSESSMENT SYSTEM FOR FIBER REINFORCED COMPOSITE STRUCTURES Final Report
Roger M. Crane, Aleksander B. Macander, and James Gagorik (Naval Sea Systems Command) Nov. 1982 25 p
(ZF66412001)
(AD-A122468; DTNSRDC/SME-82-92) Avail: NTIS HC A02/MF A01 CSCL 11/4

There are a limited number of nondestructive evaluation techniques available for field inspection of large composite structures and practically no viable techniques for in-service inspection. With this in mind, an innovative Damage Assessment System is proposed which is based on a concept of using an optical fiber mesh, implanted into the body of a fiber reinforced composite structure. Such a mesh would become an integral part of the structure during the course of its fabrication. The selection of the mesh fibers would be predicated on their strain to failure characteristics and strain compatibility with the base composite reinforcing fibers. This optical system will be capable of locating damage, assessing severity and monitoring damage growth. A successful implementation of the total Damage Assessment System would involve the interaction of the optical fiber mesh with an adequately designed interrogative electronic package. This report focuses on the former aspect of the total system. It will address some recent experimental work showing the practicality of the concept in assessing various modes of failure due to impact of composite plates, optical fiber selection, location and spacing of fibers, as well as the utility of the system for damage assessment in large, complex composite structures. Author (GRA)

N83-21043# Dayton Univ., Ohio. Research Inst.
GLOBAL-LOCAL LAMINATE VARIATIONAL MODEL Interim Report, 1 Feb. - 30 Nov. 1981
Som R. Soni and Nicholas J. Pagano (AFWAL) Wright-Patterson AFB, Ohio AFWAL Mar. 1982 56 p refs
(Contract F33615-81-C-5056; AF Proj. 2419)
(AD-A121747; AFWAL-TR-82-4028) Avail: NTIS HC A04/MF A01 CSCL 11/4

The absence of a unified, tractable model to predict the elastic response of a multi-layered laminate (say 100 layers) has foiled attempts to understand the failure modes of practical composite structures. Global models, which follow from an assumed displacement field and lead to the definition of effective (or smeared) laminate moduli, are not sufficiently accurate for stress field computation. On the other hand, local models, in which each layer is represented as a homogeneous anisotropic continuum, become intractable as the number of layers becomes even moderately large (approximately 10). In this work, we blend these concepts

into a self-consistent model which can define detailed response functions in a region of interest (local), while representing the remainder of the domain by effective properties (global). In this investigation the laminate thickness is divided into two parts. A variational principle has been used to derive the governing equations of equilibrium. For the global region of the laminate, potential energy has been utilized, while the Reissner functional has been used for the local region. The field equations are based upon an assumed thickness distribution of stress components within each layer of the local region and displacement components in the global region. The derived boundary of the global region and the prescribed tractions (pointwise in an elasticity sense) satisfy the conditions of vanishing resultant force and moment identically. The same conditions are satisfied in the local region. GRA

N83-21044# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
SELECTED BIBLIOGRAPHY ON FIBER-REINFORCED CEMENT AND CONCRETE, SUPPLEMENT NUMBER 4 Final Report
George C. Hoff Aug. 1982 42 p
(AD-A122237; WES/MP-C-76-6-Suppl-4) Avail: NTIS HC A03/MF A01 CSCL 05/2

A bibliography is given listing studies on fiber reinforced cements and concretes. R.J.F.

N83-21045# Texas A&M Univ., College Station. Mechanics and Materials Center.
COMPOSITE MATERIALS FOR STRUCTURAL DESIGN Final Annual Technical Report, 1 Jan. - 31 Dec. 1981
W. L. Bradley, W. E. Haisler, J. S. Ham, R. A. Schapery, and Y. Weitsman Mar. 1982 102 p refs
(Contract F49620-78-C-0034; AF Proj. 2307)
(AD-A122262; MM-3724-82-1; AFOSR-82-1018TR; ATR-4) Avail: NTIS HC A06/MF A01 CSCL 11/4

Research activities related to advanced fiber reinforced plastics are reported in detail for the final year of the initial contract on the continuing composites program at Texas A&M. Work was initiated or continued in the areas of fracture, delamination, fatigue, and residual stresses in elastic and viscoelastic composites. Delamination fracture toughness is investigated using macroscopic measurements of fracture toughness to determine critical energy release rate for crack propagation and is interpreted in terms of microscopic mechanisms of fracture determined from careful examination of the fracture surface using a scanning electron microscope. Additional experimental work in compression-induced delamination and delamination under complex load histories is presented. Analytical methods are developed for prediction of the mechanical state and energy release rate for delamination and used in the investigation of tensile coupons with various amounts of delamination and matrix degradation due to microcracking. A viscoelastic crack growth theory for nonlinear media was developed earlier in the program and this work is being extended to develop a damage theory of laminates. An investigation of the effects of moisture and temperature on residual stresses in composite laminates is continuing. Solution forms which relate curvatures in unsymmetric cross-ply laminates to temperature excursions and moisture content, including viscoelastic effects, were formulated and programmed. GRA

N83-21046# California Univ., Livermore. Lawrence Livermore Lab.
SCANNING-ELECTRON-MICROSCOPY STUDY OF ARGON-PLASMA-TREATED AND UNTREATED PEEL-TEST KEVLAR 49/POXY LAMINATES
Jean A. Ingraham, Judy Walter, Cesar O. Pruneda, and Roger J. Morgan Oct. 1982 6 p refs
(Contract W-7405-eng-48)
(DE83-003856; UCID-19607) Avail: NTIS HC A02/MF A01

Two hundred watt RF argon plasma treatment of Kevlar fibers for four minutes increases the fiber/epoxy interfacial bonding. However, as a consequence of this increase in fiber-matrix bonding, the fiber is readily fibrillated during laminate deformation and failure. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N83-21047 National Physical Lab., Teddington (England). Div. of Materials Applications.
THE USE OF A FOURIER ANALYSER FOR DETERMINATION OF THE SURFACE TENSION OF LIQUID METALS BY THE LEVITATION DROP TECHNIQUE
B. J. Keene Dec. 1982 31 p refs
(NPL-DMA(A)-56; ISSN-0143-7313) Copyright. Avail: Issuing Activity

A Fourier analyzer was used in association with the levitating drop technique to measure the surface tension of some group VIII metals. The frequency spectrum revealed 3 or 5 principal peaks, instead of one as predicted by the Rayleigh equation. Calculations were made for the surface tension of Fe, Co, Ni, and Cu by substituting, both the center frequency, and the frequency used in the Rayleigh equation. Results suggest that there was probably no significant between the two sets of data derived. In keeping with prediction, the results for these four metals were generally found to be higher than the bulk of the extant data. It was thought that this reflected the low oxygen contamination inherent in this method. Author (ESA)

N83-21048 Defence Research Information Centre, Orpington (England).
THE DETERMINATION OF TOTAL MERCURY IN VARIOUS WATERS BY ATOMIC ABSORPTION SPECTROMETRY AFTER DECOMPOSITION OF ORGANOMERCURIALS BY HYDROCHLORIC ACID-PERMANGANATE OR BROMINE MONOCHLORIDE
O. Szakacs, A. Lasztity, and Z. Horvath Nov. 1982 14 p refs Transl. into ENGLISH from Magyar Kemiai Folyoirat (Hungary), v. 87, no. 10, 1981 p 458-462
(DRIC-T-6798; BR85933) Copyright. Avail: Issuing Activity

Two methods of determination of organic mercury in natural and processed waters are presented. One uses acid permanganate and the other bromine monochloride to decompose the organic component. In both cases, mercury was determined by atomic absorption and the limits of detection were 0.12 micro g/1 and 0.06 micro g/1 respectively at the 3 sigma level and interferences were minimal. S.L.

N83-21049# Central Electricity Generating Board, London (England).
ULTRAVIOLET SPECTROPHOTOMETRIC DETERMINATION OF MICROGRAM AMOUNTS OF SULPHITE ION
Tadao Okutani, Shunsuke Ito, and Satori Utsumi 27 Oct. 1983 12 p refs Transl. into ENGLISH from Nippon Kagaku Zasshi (Japan), v. 88, no. 12, 1967 p 1296-1299
(BLL-CE-Trans-7790-(9033.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The best known method of determining sulphur dioxide is colorimetric determination entailing absorption in sodium tetrachloromercurate solution color development with para-rosaniline and formaldehyde. Determination by absorption in sodium tetrachloromercurate solution and measurement of ultraviolet absorption (228 nm) was described. Mercury (II) nitrate solution was not previously employed as a sulphur dioxide absorbent, since redox reaction occurs with sulphite solutions of high concentration. When determining sulphite by the mercury salt diphenylcarbazone-benzene extraction method, we found that solutions containing a very small concentration of sulphurous acid and excess mercury (II) nitrate exhibited prominent absorption in the ultraviolet region yet remained stable. Author

N83-21050# Central Electricity Generating Board, London (England).
ON THE SOLUBILITY OF MECHANICALLY ACTIVATED APATITES
K. Sigrist, R. Pothig, and R. Paudert 27 Oct. 1983 15 p refs Transl. into ENGLISH from Z. Phys. Chem. (Leipzig (East Germany), v. 261, no. 5, 1980 p 847-856
(BLL-CE-Trans-7771-(9022.090)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

By determining specific initial rates of dissolution and of activation energies of the dissolving process it can be demonstrated that the increase in rate of dissolution caused by mechanical activation is not only the result of an increase in surface but that a decision role is played by changes in the apatite structure. Under the given external conditions, the dissolution process is not controlled by diffusion but by reaction. The dissolution process can be mathematically described with the aid of a model based on formal kinetics if the reduction in specific surface associated with the dissolution is taken into consideration in special formulations. Author

N83-21051# Central Electricity Generating Board, London (England).
DESULPHURISATION OF SOLID FUELS IN POWER STATIONS BY SUPERCONDUCTIVE MAGNETS
H. Doerr, F. P. Monostory, and M. Seidl 26 Nov. 1982 21 p refs Transl. into ENGLISH from Glueckauf (West Germany), v. 117, no. 17a, 1981 p 11-17
(BLL-CE-Trans-7855-(9022.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Desulphurization of solid fuels in power station by superconductive magnets was studied. A superconductive strong field magnetic separator was interated in the inner grinding circuit of a coal mill as a dry process for the physical mineral and pyrite separation from power station coal. Further development work is required to make the process suitable for customary plant sizes. The process cannot replace, but only assist desulphurization of the flue gases in the case of coal with over 0.6% organic sulphur/t ce even with an emission value of 3.75 kg SO2/MWh. Depending on the sulfur or pyrite content of the power station coal supplied, the efficiency and costs of flue gas desulphurization and the limit value of the permissible SO2 emission, the combination of pulverized coal and flue gas desulphurization may be economically advantageous in limiting cases. S.L.

N83-21052# Bonn Univ. (West Germany). Inst. fuer Physikalische.
FUNDAMENTAL RESEARCH ON FISCHER-TROPSCH SYNTHESIS Final Report, Jul. 1981
Manfred Ritschel, Hans-Wilhelm Buschmann, and Wolf Vielstich Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-020; ISSN-0340-7608) Avail: NTIS HC A06/MF A01

At the present state of knowledge a detailed comparison of the different processes of coal refining cannot be carried out. The economics of the Fischer-Tropsch synthesis highly depends on the enhancement of products of technical interest as C2-C4 olefines. To get new insights into the mechanism of the Fischer-Tropsch (F.T.) reaction and the distribution of its reaction products on their C numbers investigation of the F.T. synthesis in a laboratory scale reactor, the hydrogenation and the hydrolysis of F.T. catalysts, and the adsorption and desorption of reactands and intermediates were conducted. The investigation resulted in the formulation of a reaction mechanism involving carbidic C atoms. From this mechanism the distribution of the reaction products can be deduced. The validity of this mechanism is demonstrated by the analysis of numerous F.T. product spectra. Author

N83-21053# STEAG A.G., Essen (West Germany).
FLUE GAS DESULFURIZATION WITH WASTE WATER EVAPORATION. PHASE 2: OBSERVATION OF THE EXPERIMENTS AT WEIHER II Final Report, Jul. 1981
Helmut Brauweiler, Robert Karger (Vereinigte Elektrizitaetswerke Westfallen AG), and Udo Starke (Vereinigte Elektrizitaetswerke Westfallen AG) Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 20 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-026; ISSN-0340-7608;
BMFT-03E1148A/ETS6004:) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4,20

A process for cleaning flue gases with high chloride content from coal fired power plants was tested. Dealing with a comparison of processes, 'Reduction of sulfur dioxide emission, choice of flue gas desulfurization process', indicated that the SHU process has a certain potential especially with regards to reducing the amount of waste water. The anticipated advantage has to be proven by pilot scale testing followed by industrial scale trial. The results of the R+D project show that operation with 25% per weight of CaCl2 is feasible with regard to desulfurization and oxidation. The appreciable lowering of waste water is, however, only possible when the quality requirement of gypsum with respect to the Cl(-) content is decreased. S.L.

N83-21054# Saarbergwerke A.G. Saarbrueken (West Germany). Hauptabeilung Forschung und Entwicklung.
ENLARGEMENT OF THE RAW MATERIAL BASIS OF REFINERIES BY INCLUDING HARD COAL: PILOT PLANT FOR COAL HYDROGENATION, CONSTRUCTION PHASE Final Report, Apr. 1982
Rainer Lodes, Bernhard Lohr, Albert Oleownik, and Klaus Reifarth Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 58 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-I-82-192; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

The design, construction and commissioning of a pilot plant for direct coal hydrogenation with a maximum coal throughput of 6 t/d is discussed. This plant is based on the proven IG-process. The design data for the modified process was experimentally obtained during laboratory scale investigations, including newly introduced process steps. Author

N83-21055# Unilever Research, Vlaardingen (Netherlands).
THE CONCEPT OF NEGATIVE HAMAKER COEFFICIENTS. PART 1: HISTORY AND PRESENT STATUS
J. Visser 1982 14 p refs Presented at Symp. on Negative Hamaker Coefficients and Repulsive Van der Waals Interactions, 27 Aug. 1980, Las Vegas Submitted for publication
Avail: NTIS HC A02/MF A01

The concept of negative Hamaker coefficients is introduced and the conditions for attaining negative values are given. This concept remains also valid against the background of Lifshitz' macroscopic theory of interaction between solid bodies. Numerical examples calculated on the basis of this theory are presented. Experimental verification of the concept as well as simplified expressions to establish the conditions for attaining negative values are also given. Further refinements of the theory leading to the concept of Hamaker coefficients rather than to that of Hamaker constants are dealt with and the relevant role of interfacial separation is discussed. Author

N83-21056*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
THE ELECTROCHEMICAL FLUORINATION OF POLYMERIC MATERIALS FOR HIGH ENERGY DENSITY AQUEOUS AND NON-AQUEOUS BATTERY AND FUEL CELL SEPARATORS Final Report
Chung-Chiun Liu Feb. 1983 103 p refs
(Contract NAG3-66)
(NASA-CR-167961; NAS 1.26:167961) Avail: NTIS HC A06/MF A01 CSCL 07D

A computerized system was established and the electrochemi-

cal fluorination of trichloroethylene, polyacrylic acid and polyvinyl alcohol in anhydrous hydrogen fluoride was attempted. Both solid substrates as well as membranes were used. Some difficulties were found in handling and analyzing the solid substrates and membranes. Further studies are needed in this area. A microprocessor aided electrochemical fluorination system capable of obtaining highly reproducible experimental results was established. Author

N83-21057*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Chemistry.

KINETICS OF THE REACTIONS OF THE ACID ANHYDRIDES WITH AROMATIC AMINES IN APROTIC SOLVENTS M.S. Thesis. Final Report

Elizabeth Sugg and John G. Mason 31 Mar. 1983 73 p refs
(Grant NsG-1085)
(NASA-CR-170105; NAS 1.26:170105) Avail: NTIS HC A04/MF A01 CSCL 07D

Work has revealed that diamine derivatives of diphenylmethane (IV), diphenyl ether (V), benzophenone (IV), fluorene (VII), and fluorenone (VIII) polymerizations with pyromellitic dianhydride in DMA were dependent on the basicity of the amine compound. The correlation between the basicity of the amine and its reactivity with phthalic anhydride was determined. Basicity measurements were made by potentiometric titration of each amine in an acetonitrile-water solvent system, from which the pKa of the amine could be determined. Rectivity was defined in terms of the second order rate constant derived form spectrophotometric examination of the reaction between each amine and phthalic anhydride in DMA. This reaction was expected to proceed in either one (for a monoamine) or two (for a diamine) stages. S.L.

N83-21058*# National Aeronautics and Space Administration, Washington, D. C.

MOLLIER-I, S-DIAGRAMS FOR COMBUSTION GASES IN DATA PROCESSING

Friedemann Zacharias Nov. 1982 26 p refs Transl. into ENGLISH from Motortech. Z. (West Germany), v. 31, no. 7, 1970 p 296-303 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76997; NAS 1.15:76997) Avail: NTIS HC A03/MF A01 CSCL 21B

In order to have all the thermal and caloric states of combustion gases accessible in a computer, closed mathematical approximation equations were established for the real factors, the enthalpy and the entropy of a real combustion gas. The equations approximate the various effects of molecular forces real gas influence and dissociation - at temperatures of 200 K to 6,000 K, pressures of 0.001 to 1,000 bar, and in the range from stoichiometric composition to air. A system of subprograms is listed in FORTRAN, by means of which thermodynamic calculations can be carried out in the same manner as with Mollier I,S diagrams. Author

N83-21059# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

ASPHALTS: RECENT FINDINGS REGARDING THEIR STRUCTURE AND PROPERTIES

H. J. Neumann 1983 27 p refs Transl. into ENGLISH from Erdoel Kohle, Erdgas, Petrochem. (West Germany), v. 34, no. 8, 1981 p 336-342
(NRC/CNR-TT-2048; ISSN-0077-5606) Avail: NTIS HC A03/MF A01

Asphalt represents the residue of the vacuum distillation of certain crude oils. It is a naturally occurring multicomponent mixture of high boiling and nonboiling substances. The colloidal constituents of crude oils, i.e., asphaltenes and petroleum resins, are present in high concentrations in these mixtures. Their composition of higher molecular weight hydrocarbons and polar sulfur, oxygen and nitrogen heterocompounds, on the one hand, and their colloidal structure, on the other, determine their performance characteristics. Their position in the consistency diagram and their rheological deformation behavior are of special significance. These qualities are mainly a function of the concentrations of asphaltenes and petroleum resins, which can be modified by distillation and by blowing in a defined manner. Author

N83-21060# Texas A&M Univ., College Station. Dept. of Chemistry.

A STUDY OF POLYNUCLEAR AROMATIC HYDROCARBONS ON AN AMINO BONDED PHASE LIQUID CHROMATOGRAPHIC COLUMN IN THE NORMAL AND REVERSED PHASE Interim Technical Report

Dori Karlesky, Dennis C. Shelly, and Isiah M. Warner 24 Nov. 1982 32 p refs
(Contract N00014-80-C-0703)
(AD-A122543; TAMU/DC/TR-82-11) Avail: NTIS HC A03/MF A01 CSCL 07/4

Experiments were run using an n-propyl amine polar bonded phase (Chromosorb LC-9) liquid chromatographic column in both the normal and reversed phase mode. Results confirm that the mechanism of separation in the normal phase is due mainly to a charge transfer interaction between the lone pair electrons on the stationary phase nitrogen and the pi electron cloud of the solute PNAs. Elution order seems to depend upon a combination of pi energy, and type of ring condensation of the solute. Plots of log I versus number of aromatic carbons for catacondensed PNAs suggest that while the specific interaction is different than that seen in silica chromatography, the overall adsorption effect is comparable. In the reversed phase there may be two types of separation mechanisms: (1) a pure partitioning effect in highly polar mobile phases (methanol/water), or (2) a mixture of liquid-solid adsorption and liquid-liquid partition in less polar solvent systems (acetonitrile/water). Author (GRA)

N83-21061# Illinois Univ., Chicago. Dept. of Chemistry.

HIGH ENERGY MATERIALS: NEW PREPARATIVE APPROACHES TO NITRO AND NITROSO DERIVATIVES Final Report, 1 Apr. 1979 - 31 Mar. 1982

Joseph H. Boyer, V. T. Ramakrishnan (Madras Univ.), T. Perumal Pillai, and Chorngbao Huang Aug. 1982 85 p refs
(Contract N00014-79-C-0353)
(AD-A121428) Avail: NTIS HC A05/MF A01 CSCL 07/3

Contents: C2nN2n02n Systems. Proximate Nitro and Cyano Groups; Bicyclic Peroxides from a 1,4-Diazepine; Oxidation at Nitrogen in Benzo-, Benzodi-, and Benzotrifuroxans; Oxidation of Nitrobenzofuroxans; The Ambiphilic Furoxan Ring. Benzofuroxan Oxidation by Peracid and Reduction by Copper; Dicyanofuroxan and Hydrazine or Hydroxylamine; Bromine Oxidation of the Dipotassium Salt of alpha, alpha-Dinitrosuccinonitrile into the Potassium Salt of Nitroketosuccinonitrile; Q-Cyanomethyloxime of Nitroglyoxylonitrile; Peroxide Oxidation of Diaminomaleonitrile and Derivatives; A 7-Azanorbornene from a Pyrrole and Tetracyanoethylene; and Nitrosamines and Nitroamines from sec- and tert-aliphatic amines. GRA

N83-21062# University of Southern California, Los Angeles. Dept. of Mechanical Engineering.

ABSTRACTS: 1982 AFOSR CONTRACTORS MEETING ON AIR BREATHING COMBUSTION DYNAMICS RESEARCH Interim Report

M. Gerstein and R. Choudhury Nov. 1982 101 p refs Meeting held in Clearwater Beach, Fla., 1-4 Nov. 1982
(Grant AF-AFOSR-0222-82; AF Proj. 2308)
(AD-A121647; AFOSR-82-0841TR) Avail: NTIS HC A06/MF A01 CSCL 21/1

This report consists of a collection of expanded abstracts of the numerous research progress reports given by AFOSR supported contractors on the Air Force basic research program on Energy Conversion Related to Air-Breathing Propulsion and Explosions and of invited papers from other governmental agencies and contractors. These papers presented over a four-day period composed the 1982 contractors meeting on Air-Breathing Combustion Dynamics Research. The principal investigators and their organizational association are also identified. GRA

N83-21063# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Chemical Systems Lab.
GAS-SOLID CHROMATOGRAPHY STUDIES USING ACTIVATED CHARCOALS TREATED WITH 4-VINYLPYRIDINE
Gerhard Magin, Edward J. Poziomek, James A. Baker, and William S. Magee, Jr. Oct. 1982 25 p refs
(DA Proj. 1L1-61102-A-71A)
(AD-A122284; AD-E410607; ARCSL-TR-82031) Avail: NTIS HC A02/MF A01 CSCL 07/4

The present paper reports the performance of a series of 4-vinylpyridine-impregnated charcoals as gas-solid chromatograph columns in the retention of water, a series of alcohols (methanol, ethanol, n-propanol, iso-propanol, n-butanol, tert-butanol), and several hydrocarbons (methane, ethane, propane, cyclopropane). The 4-vinylpyridine loading ranged up to 30% by weight. The activated charcoal was a coal-based one with a surface area of about 1000 sq m/gm. The use of activated charcoal in gas chromatography centers around the analysis of low boiling gases and hydrocarbons. Treatment of activated charcoal with 4-vinylpyridine led to decreases in both retention times and heats of adsorption for the organics examined. Increasing the 4-vinylpyridine content resulted in further decreases; an exception was noted with water in which case a minimum in the retention time was noted with charcoals containing 3% to 5% 4-vinylpyridine. GRA

N83-21064# Kansas State Univ., Manhattan. Dept. of Chemistry.
SYNTHETIC AND MECHANISTIC STUDIES IN FLUORINE CHEMISTRY. NEW DEVELOPMENTS IN ORGANONITROGEN FLUORINE CHEMISTRY Final Technical Report, 15 Jan. 1977 - 31 Jul. 1982
Darryl D. DesMarteau 30 Nov. 1982 9 p refs
(Contract DAAG29-80-C-0102; Grant DAAG29-77-G-0071)
(AD-A122663; ARO-14339.11-CH; ARO-17108.13-CH) Avail: NTIS HC A02/MF A01 CSCL 07/3

The reaction chemistry of the novel oxaziridine 2-trifluoromethyl-3,3-difluorooxaziridine, CF3NCF2O, (acronym PFAPO-pentafluoroazapropene oxide) is described, PFAPO shows many similarities to HFPO-hexafluoropropene oxide, CF3CFCF2O, a commercially important monome for polymer synthesis. PFAPO undergoes ring opening by many nucleophiles leading to polymers or compounds of the type CF3N(Nu)C(O)F. The latter can be converted to amines CF3N(NU)H by reaction with H2O3/NaF and to imines CF3=NNu by reaction with KF. PFAPO also exhibits chemistry unique from that in that it undergoes novel cycloadditions with olefins and ketones, with itself in the presence of SbF5 and possibly with nitriles. These reactions are very unusual from a mechanistic standpoint and provide novel heterocycles and polymers with potentially useful properties. New chemistry of perfluoroimines is examplified by perfluoromethanimine, CF2=NF. A novel chlorofluorination of ClCN, followed by dechorination with Hg in TFAA provides an excellent high-yield synthesis. This imine exhibits a rich chemistry in the presence of fluoride ion, which generates the perfluororeactions leading to novel examples of organonitrogen fluorine compounds. Perfluoromethanimes can also be cationically polymerized to form a unique N-F polymer (CF2NF) sub n. GRA

N83-21065# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
BROADBAND N(2) AND N(2)O CARS SPECTRA FROM A CH(4)-N(2)O FLAME
L. E. Harris Dec. 1982 30 p refs
(AD-A122654; AD-E400941; ARLCD-TR-82020) Avail: NTIS HC A03/MF A01 CSCL 21/2

Broadband CARS spectra of N(2) and N(2)O have been obtained from the reaction zone and the post flame gases of a lean CH(4)-N(2)O flame using the nonplanar BOXCARS technique. The temperature and concentration of N(2) and the concentration of N(2)O were estimated from the CARS spectra with the aid of model calculations. The temperature and concentration profiles obtained allow insight into the elementary processes occurring in the flame. GRA

N83-21066# Air Force Academy, Colo.
CHEMILUMINESCENT REACTION OF TELLURIUM WITH FLUORINE
Harvey W. Moody, Joseph A. Menapace, Chester J. Dymek, Jr., and M. L. Scott Nov. 1982 23 p
(AF Proj. 2303)
(AD-A122637; FJSRL-TR-82-0008) Avail: NTIS HC A02/MF A01 CSCL 20/10

Tellurium vapor reacts with gaseous fluorine to produce a chemiluminescent flame. The emission in the visible and near infrared part of the spectrum of the flame has been previously attributed to the A2 psi - X 2 psi - X system of TeF. Excited TeF produced in the flame was investigated as a possible candidate for chemical lasing. This work was intended to further characterize the TeF flame using computer controlled simultaneous optical and mass spectroscopy. Assignment of some band head wavelengths in the TeF(A-X) system were checked and a mass spectrum of the flame was obtained. The mass spectrum revealed the presence of TeF, TeF2, TeF3, and TeF5 in the flame. The apparently complex chemistry and the distribution of chemical energy over several vibrational levels in excited TeF suggest that this flame is not a promising candidate for chemical laser development. GRA

N83-21067# Los Alamos Scientific Lab., N. Mex.
X-RAY FLUORESCENCE ANALYSIS MAJOR ELEMENTS IN SILICATE MINERALS
Roland C. Hagan Sep. 1982 14 p refs
(Contract W-7405-eng-36)
(DE83-003968; LA-9400-MS) Avail: NTIS HC A02/MF A01

An automated wavelength-dispersive X-ray fluorescence spectrometer is operational for analysis of major elements in rocks and minerals. Procedures for trace-element analysis are being developed. Sample preparation methods and analytical techniques are similar to those commonly used elsewhere, but data reduction is conducted by the Fundamental Parameters program developed by Criss. Unlike empirically derived calibration curves, this data reduction method considers X-ray absorption and secondary fluorescence, which vary with differences in sample composition. X-ray intensities for each element from several standards are averaged to develop a theoretical standard for comparison with samples of unknown composition. Accurate data for samples with wide compositional ranges result from these data reduction and standardization techniques. DOE

N83-21068# Montana State Univ., Bozeman. Dept. of Chemical Engineering.
CATALYTIC HYDROGENATION OF COAL-DERIVED LIQUIDS Interim Report, Jun. - Sep. 1982
Lloyd Berg and F. P. McCandless Dec. 1982 42 p
(Contracts DE-AC22-76ET-10495; EX-76-C-01-2034)
(DE83-003582; DOE/ET-10495/28; FE-2034-28) Avail: NTIS HC A03/MF A01

The quantitative effect of pressure and temperature on the denitrogenation, desulfurization and conversion to gasoline and naphtha of solvent refined coal (SRC)-2 by catalytic hydrotreating-hydrocracking was demonstrated by varying both pressure and temperature during a single continuous run. Improved performance in each respect was attained at the higher pressure and temperature. Three different catalysts and three different ratios were evaluated to determine whether a partially hydrogenated heavy creosote would act as a donor solvent in the upgrading of SRC-2. Only one condition gave increased denitrogenation but not enough improvement to compensate for the extra effort involved. Seven combinations of cobalt, molybdenum, nickel and tungsten on an alumina base carrier were evaluated to determine the combination best suited to the upgrading with water addition. The catalysts were evaluated relative to their ability to denitrogenate, desulfurize and convert the SRC-2 to gasoline, middle distillate and heavy oils. DOE

N83-21069# Department of Energy, Morgantown, W. Va. Advanced Gasification Section.
ADVANCED GASIFICATION PROJECTS

Feb. 1982 77 p refs
(DE83-003616; DOE/METC-SP-188) Avail: NTIS HC A05/MF A01

An analysis of the needs for coal gasification reveals the following principal categories of information gaps that can be filled by programs already in progress or those readily initiated. The gaps are technology base needs required for successful application of both currently available and advanced gasification processes. The need areas are classified as follows: Reactor design/performance, gas cleaning/cooling separation, acid-gas removal/gas shift/gas conversion, wastewater treatment, and general data base on both state-of-the-art and advanced technologies. During the future operating and optimization phases of most of the coal gasification projects, when additional troubles will surface, the technical support program described will have provided the additional data base needed to correct deficiencies and/or to advance the state-of-the-art. US DOE supported projects in this area are described. DOE

N83-21070# California Univ., Berkeley. Dept. of Chemistry.
HYDROGEN AND DEUTERIUM NMR OF SOLIDS BY MAGIC-ANGLE SPINNING Ph.D. Thesis
Richard Raymond Eckman Oct. 1982 225 p refs
(Contract DE-AC03-76SF-00098)
(DE83-003634; LBL-14200) Avail: NTIS HC A10/MF A01

The nuclear magnetic resonance of solids has long been characterized by very large spectral broadening which arises from internuclear dipole-dipole coupling or the nuclear electric quadrupole interaction. These couplings can obscure the smaller chemical shift interaction and make that information unavailable. Two important and difficult cases are that of hydrogen and deuterium. The development of cross polarization, heteronuclear radiofrequency decoupling, and coherent averaging of nuclear spin interactions has provided measurement of chemical shift tensors in solids. Recently, double quantum NMR and double quantum decoupling have led to measurement of deuterium and proton chemical shift tensors, respectively. A general problem of these experiments is the overlapping of the tensor powder pattern spectra of magnetically distinct sites which cannot be resolved. In this work, high resolution NMR of hydrogen and deuterium in solids is demonstrated. For both nuclei, the resonances are narrowed to obtain liquid-like isotropic spectra by high frequency rotation of the sample about an axis inclined at the magic angle, (ALPHA)/sub m/ = Arccos (3/sup - 1/2/), with respect to the direction of the external magnetic field. For deuterium, the powder spectra were narrowed by over three orders of magnitude by magic angle rotation with precise control of (ALPHA). A second approach was the observation of precise control of (ALPHA). A second approach was the observation of deuterium double quantum transitions under magic angle rotation. DOE

N83-21071# State Univ. of New York, Binghamton. Dept. of Chemistry.
DESULFURIZATION WITH TRANSITION METAL CATALYSTS
John J. Eisch 1 Nov. 1982 5 p ref
(Contract DE-FG22-81PC-40782)
(DE83-003062; DOE/PC-40782/T3) Avail: NTIS HC A02/MF A01

The principal objective was to uncover new reagents and catalysts for upgrading coal-derived fuels by removing undesirable organosulfur, organonitrogen and, if feasible, organooxygen components. The following studies were continued or initiated: study of the combined desulfurizing action of nickel salts and metal hydrides, either in homogeneous media or when dispensed on a silica or polymer support; evaluation of phosphine complexes of nickel or molybdenum as potent desulfurizing agents; examination of the desulfurizing action of nickel and cobalt salts, when combined with aluminum hydrides, toward sulfones and sulfides; adaptation of nickel and cobalt agents for the desulfurization of solvent refined coal liquids; and continued search for similar agents that could denitrogenate carbazoles and quinolines. DOE

N83-21072# Pittsburgh Univ., Dept. of Chemistry.
MICROWAVE-OPTICAL DOUBLE RESONANCE SPECTROSCOPY Final Report, 1 Feb. 1971 - 31 Oct. 1980
David W. Pratt 1 Sep. 1982 32 p refs
(Contract DE-AC02-76ER-03435)
(DE83-000232; DOE/ER-03435/1; COO-3435-35) Avail: NTIS HC A03/MF A01

Optical, zero field and high field optical detection of magnetic resonance, electron nuclear double resonance, level anticrossing and cross relaxation, and electron paramagnetic resonance experiments were performed on a variety of chemical systems in order to further basic knowledge of the structure, reactivity and response to radiation of molecules in their ground and/or excited electronic states. Systems investigated include organic molecules oriented in low temperature crystals, simple free radicals, transition metal complexes, rare earth hydrides, and hemeproteins in biological enzymes. Many of these systems are of potential importance in a number of applied areas including hydrocarbon based fuel systems, solar energy devices, laser initiated photochemical reactions, and free radical mechanisms in chemical carcinogenesis. DOE

N83-21073# Cornell Univ., Ithaca, N. Y. Dept. of Chemistry.
ESR STUDIES OF SURFACE ADSORPTION AND CATALYSIS UNDER ULTRA-HIGH VACUUM CONDITIONS Progress Report, 1 Mar. 1982 - 28 Feb. 1983
Jack H. Freed Sep. 1982 80 p refs
(Contract DE-AC02-78ER-04991)
(DE83-000995; DOE/ER-04991/4; COO-4991-4) Avail: NTIS HC A05/MF A01

The phenomenon of surface-suppressed ESR (SSESR), in which stable paramagnetic radicals adsorbed on clean Ag or Cu surfaces have their ESR signal suppressed until several layers of molecules insulate subsequent layers from the metal surface was studied. This study combined UHV-ESR, CREMSEE, and thermal desorption. A tentative model based upon transmission of the effects of the surface conduction band of the metal by the weak exchange forces between the paramagnetic species was suggested. Experiments on a model system by means of laser time resolved ESE spectroscopy were performed. A photo induced transient electron was produced from Rb ions in nonpolar medium. The spin relaxation of the transient electron was studied vs temperature and alkali metal concentration. The transient electron is initially spin polarized, and the degree of spin polarization is affected by the wavelength. Such an effect would be expected from a long lived geminate radical pair mechanism causing the spin polarization, with the initial separation distance affected by the energy of the photon absorbed. DOE

N83-21074# Butler Research and Engineering Co., Inc., St. Paul, Minn.
ANALYSIS OF ALTERNATIVE SOLID-LIQUID SEPARATION TECHNIQUES IN NON-BEVERAGE FERMENTATION ETHANOL PRODUCTION
Jun. 1982 44 p
(Contract DE-FG07-81ID-12330)
(DE83-001383; DOE/ID-12330/T1) Avail: NTIS HC A03/MF A01

The biochemical and process design implications of separation alternatives were analyzed. Standard batches of corn mash were prepared and the solids and liquids were separated according to three alternative sequences: prior to fermentation; after fermentation; and after distillation. Separation methods, such as screening, filtration, and centrifugation were also examined. Biochemical tests on the supernatants and precipitates identified the effects on total precipitate, carbohydrate, protein, reducing sugars, digestible nutrients, fiber, fat, ash, nitrogen free extract, Kjeldehl nitrogen, calcium, phosphorus, potassium, pH, BOD, specific gravity, viscosity, yeast cell number, starch, dissolved oxygen, percent alcohol, percent moisture and ethanol yield. The biochemical tests demonstrate that, depending on the effectiveness of additional product recovery steps, significant variances in ethanol yields may occur as a result of separation sequence and methodology. Highest

ethanol yields without additional product recovery steps wee obtained using the after distillation separation sequence. DOE

N83-21075# Oak Ridge National Lab., Tenn.
ELECTROMIGRATIONAL COMPOSITION GRADIENTS IN MOLTEN CARBONATES: A REVIEW
J. Braunstein and C. E. Vallet Oct. 1982 63 p refs
(Contract W-7405-eng-26)
(DE83-002593; ORNL/TM-8501) Avail: NTIS HC A04/MF A01

Computations and measurements are reviewed pertaining to studies of current induced separation of Li2CO3 and K2CO3 in molten carbonate fuel cells. Such separation is to be expected if the electrical mobilities of Li() and K() relative to carbonate are unequal. Measurements of emf relaxation following a current step are compared with predicted relaxations based on a mass transport model as well as with measured relaxation of thermoelectric temperature gradients, Seebeck potentials, kinetics of electron transfer and other possible contributions to the observed relaxation. The magnitudes and time scales of the relaxations other than that predicted from the mass transport model cannot account for the observed emf relaxation. This, together with preliminary measurements of electrical mobilities and electrolyte composition changes reported at the electrodes of molten carbonate fuel cells, suggest that an electromigrational separation is significant (although smaller than that demonstrated for Li/LiCl-KCl/FeS batteries). A summary of information needed to quantitatively characterize this effect is presented. DOE

N83-21076# Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Technology Div.
LOW-TEMPERATURE PYROLYSIS OF COAL TO PRODUCE DIESEL-FUEL BLENDS
Toby B. Shafer, Orlando J. Jett, and Jiann-Shing Wu Oct. 1982 58 p refs
(Contract W-7405-eng-26)
(DE83-001637; ORNL/MIT-355) Avail: NTIS HC A04/MF A01

Low temperature (623 to 7730 K) coal pyrolysis was investigated in a bench scale retort. Factorially designed experiments were conducted to determine the effects of temperature, coal particle size, and nitrogen flow rate on the yield of liquid products. Yield of condensable organic products relative to the proximate coal volatile matter increased by 3.1 and 6.4 wt% after increasing nitrogen purge flow rate from 0.465 to 1.68 L/min and retort temperature from 623 to 7230 K, respectively. The liquid product may be suitable for blending with diesel fuel. The viscosity and density of coal liquids produced at 7230 K were compared with those of diesel fuel. The coal liquids had a higher carbon to hydrogen ratio and a lower aliphatic to aromatic ratio than premium quality No. 2 diesel fuel. It was recommended that liquids from coal pyrolysis be blend in internal combustion engines. DOE

N83-21077# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
PARTIAL LIQUEFACTION OF COAL BY FLASH HYDROPYROLYSIS Final Technical Report
C. L. Oberg, A. Y. Falk, D. R. Kahn, and L. P. Combs 20 Sep. 1982 222 p refs
(Contracts DE-AC22-76ET-10144; EX-76-C-01-2044)
(DE83-001145; ESG-DOE-13384; FE-2044-52) Avail: NTIS HC A10/MF A01

Routine reactor operation with caking western Kentucky bituminous coals was established. Overall carbon conversions typically were in the 55% to 65% range. Carbon conversion to liquid hydrocarbons ranged between 30% to 40%, typically, with as much as 11% carbon conversion to BTX aromatics. Good progress was made toward characterizing the quality and properties of the liquid product. Most of the remaining converted carbon was high value gases (e.g., CH4, CO, C2H4, C2H6) useful as pipeline SNG and chemical plant feed stocks. The unconverted carbon was collected as a fine granular dry char suitable for direct feeding to a partial oxidation coal/char gasifier for hydrogen production. The commercial potential of flash hydroliquefaction was assessed. A 74% potential overall thermal efficiency and an average product selling price lower than those estimated for several competing coal liquefaction processes. DOE

N83-21078# State Univ. of New York, Buffalo. Dept. of Chemical Engineering.
CATALYTIC COAL LIQUEFACTION Final Report
Sol W. Weller 1981 55 p refs
(Contract DE-AC22-76ET-10518)
(DE83-001098; DOE/ET-10518/T4) Avail: NTIS HC A04/MF A01

Monolith catalysts of MoO3-CoO-Al2O3 were prepared and tested for coal liquefaction in a stirred autoclave. The O2 chemisorption and BET surface area were measured on a series of Co/Mo/Al2O3 catalysts derived from Cyanamid 1442A. Some MoO3-Al2O3 catalysts over the loading range 3.9 to 14.9 wt % MoO3 were studied with respect to BET surface (before and after reduction), O2 chemisorption at -780 C, redox behavior at 5000 C, and activity for cyclohexane dehydrogenation at 5000 C. The relative thermodynamic stability of SnCl2, Sn, SnO2, and SnS in the presence of H2, HCl, H2S and H2O was calculated. Ferrous sulfate dispersed in methylnaphthalene reduced to ferrous sulfide under typical coal hydroliquefaction conditions. This suggests that ferrous sulfide may be the common catalytic ingredient when either ferrous sulfate impregnated on powdered coal, or finely divided iron pyrite is used as the catalyst. DOE

N83-21079# Department of Energy, Washington, D. C. Energy Information Administration.
SURVEY OF LARGE COMBUSTORS: ALTERNATIVE FUEL BURNING CAPABILITIES OF LARGE BOILERS IN 1979
12 Feb. 1982 26 p refs
(DE82-008386; DOE/EIA-0304) Avail: NTIS HC A03/MF A01

Data are summarized from a survey of 6647 large industrial boilers which were actually in operation during the 1979. These boilers consumed a total of 4433.4 trillion Btu of purchased and nonpurchased fuels. Of this amount, 1382.5 trillion Btu or 31% was natural gas. Consumption of fuel oil, coal, pulping liquor, and waste gases was considerably smaller, ranging from 536.7 trillion Btu to 786.3 trillion Btu. Alternative-fuel burning capabilities were reported for 4598 of these boilers (70%); these consumed a total of 3461.8 trillion Btu of fuel. Most of these boilers (3683) had the capability of burning natural gas as one of the alternative fuels. The most common alternative-fuel burning capability was natural gas and fuel oil (2256 boilers). The second most common was natural gas, fuel oil, and one or more other fuels not including coal (685 boilers). There is widespread capability to burn either natural gas or fuel oil in the respondent's reported boilers. DOE

N83-21080# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
STATUS OF MATERIALS EVALUATION FOR SULFURIC ACID VAPORIZATION AND DECOMPOSITION APPLICATIONS
R. L. Ammon 1982 22 p refs Presented at the World Hydrogen Energy Conf., Pasadena, Calif., 13 Jun. 1982
(Contract DE-AC02-78ET-20608)
(DE82-009941; CONF-820605-16) Avail: NTIS HC A02/MF A01

Candidate materials were screened for possible application in the acid vaporizer and SO3 reduction reactor. The initial screening tests were completed and based on metallographic inspection, reference materials were selected for further endurance testing. Silicon carbide was selected as the reference acid vaporizer material and four reduction reactor alloys, Carpenter 20Cb3, 444 (18Cr-2Mo-Ferritic SS), Incoloy 800 and Hastelloy Ge were selected for endurance testing. Incoloy 800 and Hastelloy G were atomized (aluminum diffusion coated). Selection of a reference reduction reactor material is aided by endurance test results, which are in progress. DOE

N83-21081# Oak Ridge National Lab., Tenn.
SYSTEM FOR THE MONITORING OF ELECTROCHEMICAL POTENTIAL UNDER NONCONDENSING CONDITIONS; ASSEMBLY AND USE WITH A URANIUM/SILVER CELL. SANL 712-014, SANL 803-030 AND SANL 903-053 Final Report

J. S. Bullock 25 Mar. 1982 48 p
(Contract W-7405-eng-26)
(DE82-016144; Y/DU-236) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A system which monitors the electrochemical potential of corroding/oxidizing metals under noncondensing conditions was assembled from standard vacuum hardware and custom glass and Teflon components. Gas composition over the specimen can be varied; water vapor, H2, O2, Ar, and CO2 were used. Total pressure, water vapor pressure, specimen temperature, and specimen reference potential difference are all measured and plotted using a multipoint recorder. An LSI-11/23-controlled data acquisition system is available for this work. An example experiment, using an alpha-uranium specimen bonded to a perforated silver reference electrode, is described. The uranium-silver potential difference (delta epsion E) was monitored through a series of changing environmental conditions; this parameter was sensitive to several combinations of changing gas composition and temperature. DOE

N83-21082# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
DETERMINATION OF THE NITROGEN CONTENT OF NITROCELLULOSE
B. R. Richardson Mar. 1982 9 p refs
(Contract DE-AC04-76DP-00487)
(DE82-009724; MHSMP-82-12) Avail: NTIS HC A02/MF A01

A procedure for separating nitrocellulose from PBX 9404 and its subsequent analysis for nitrogen content is discussed. Nitrogen analysis of nitrocellulose on a Perkin-Elmer Model 240 elemental analyzer yielded results about 1% absolute from the percentage of nitrogen in the nitrocellulose. Several samples were analyzed in replicate; a correlation between age and nitrogen content can be made. DOE

N83-21083# Oak Ridge National Lab., Tenn.
ENGINEERING SYSTEMS ANALYSIS OF PRESSURIZED FLUIDIZED-COMBUSTION POWER SYSTEMS
R. L. Graves, F. P. Griffin, and M. E. Lackey Apr. 1982 213 p refs
(Contract W-7405-eng-26)
(DE82-013390; ORNL/TM-8136) Avail: NTIS HC A10/MF A01

Data for the research and development program on pressurized fluidized bed combustor (PFBC) systems is provided. A broad review of PFBC technology and an analysis to determine its potential and sensitivity to key development needs is presented. Background information pertaining to the application of PFBC to the market for coal fired technology is included. The status of development is reviewed and the deficiencies in data are identified. Responses to a survey of PFBC developers are reviewed with emphasis on the high risk areas of the PFBC concept. Some of these problems are: uncertainty of life of gas turbine components; lack of demonstration of load following; and hot solids handling. Some high risk areas, such as the gas cleanup or gas turbine systems, can be relieved by reducing the severity of design conditions such as the turbine inlet temperature. DOE

N83-21084# Pacific Northwest Lab., Richland, Wash.
COMBUSTION OF OIL ON WATER: AN EXPERIMENTAL PROGRAM Final Technical Report
W. Wakamiya, S. E. Petty, A. Boiarski, and A. Putnam Feb. 1982 95 p refs
(Contract DE-AC06-76RL-01830)
(DE82-014598; PNL-3568; DOE/NBM-1002) Avail: NTIS HC A05/MF A01

How well crude and fuel oils burn on water was determined. Objectives were: (1) to measure the burning rates for several oils; (2) to determine whether adding heat improves the oils' combustibility; (3) to identify the conditions necessary to ignite fuels known to be difficult to ignite on ocean water (e.g., diesel and Bunker C fuel oils); and (4) to evaluate the accuracy of an oil burning model. Observations were made about how weathering and the thickness of the oil layer affect the combustion of crude and fuel oils. Nine oils commonly transported on the world's major waterways were tested. Burns were first conducted under warm weather conditions (approximately 30 C) and later under cold weather conditions (approximately 0 C to 10 C). DOE

N83-21085# Rockwell International Corp., Canoga Park, Calif. Energy Systems Group.
PARTIAL LIQUEFACTION OF COAL BY FLASH HYDROPYROLYSIS, PHASE 4 Final Technical Report
L. P. Combs 12 Nov. 1982 306 p refs
(Contract DE-AC22-80PC-30018)
(DE83-002167; DOE/PC-30018/6; ESG-DOE-13390) Avail: NTIS HC A14/MF A01

A 1-ton/h coal hydroliquefaction process development unit (PDU) was studied. Following facility modifications to improve material recoveries, 30 PDU tests were conducted addressing specific objectives. Two supporting experimental studies were conducted. Small specimens of several metal alloys were exposed to the PDU reaction environment and then evaluated. In a cold-flow investigation of dense-phase flow feeding, both pulverized coal and a typical FHP by-product char were fed at elevated pressures. An analytical model for uniform dense-phase plug flow of solids correlated well the experimental coal flow rate as a function of overall feed system pressure drop. Liquid product samples PDU tests were subjected to indepth characterization of their chemical make-up and properties. Through comparison with other studies of coal liquids from other liquefaction processes and with conventional petroleum processing technology, a preliminary engineering study estimated processing requirement for upgrading the PDU liquid products and estimated potential costs of such upgrading. DOE

N83-21086# International Coal Refining Co., Allentown, Pa.
SRC-I PROJECT BASELINE
Mar. 1982 323 p 2 Vol.
(Contract DE-AC05-78OR-03054)
(DE83-000987; DOE/OR-03054/T13-Vol-2) Avail: NTIS HC A14/MF A01

The Process Design Criteria Specifications forms the basis for process design for the 6000-TPSD SRC-I Demonstration Plant. It sets forth: basic engineering data, e.g., type and size of plant, feedstocks, product specifications, and atmospheric emission and waste disposal limits; utility conditions; equipment design criteria and sparing philosophy; and estimating criteria for economic considerations. Previously the formal ICRC Document No.0001-01-002 has been submitted to DOE and revised, as necessary, to be consistent with the SRC-I Project Baseline. Revision 6, dated 19 March 1982, 51 pages, was forwarded to DOE on 19 March 1982. DOE

N83-21087# Pittsburgh Univ.,
STUDIES FOR THE PRODUCTION OF SUPER-PURE SILICON NITRIDE POWDER Final Report
P. E. D. Morgan 1982 10 p refs
(Contract DE-AC02-77ER-04357)
(DE83-004383; DOE/ER-04357/1) Avail: NTIS HC A02/MF A01

The chemistry of Si-Cl, Si-I, Si-S, is investigated for production of Si3N4 powder. The sulfur routes are most interesting. (Alpha/beta ratio dependencies are discovered and the importance of breaking down the many parameters to achieve understanding of this complex compound is discussed. DOE

N83-21088# Battelle Columbus Labs., Ohio.
ADVANCED ATMOSPHERIC FLUIDIZED-BED COMBUSTION DESIGN: ULTRAHIGH VELOCITY Final Report
B. C. Kim, Robert D. Litt, Herman Nack, Frank W. Shirley, and Richard Razgaitis 20 Dec. 1982 126 p refs
(Contract DE-AC21-82MC-19331)
(DE83-004819; DOE/MC-19331/1321) Avail: NTIS HC A07/MF A01

The major findings from an advanced atmospheric fluidized bed combustion design are summarized. It is concluded from these findings that the ultra high velocity (UHV) fluidized bed combustion system meets the criteria established for an advanced AFBC

system. It has the potential for achieving significant technological and economical improvements over the existing AFBC systems. The key technical uncertainties needing resolution before this concept can be considered to have reasonable commercial potential are identified as: operability of the UHV system over the extended turndown range; potential equipment erosion problems anticipated during operation of high gas velocity and solids circulation; and the system performance over the prescribed turndown range to meet the desired performance goals. An R and D program plan to address these issues was developed, and it is believed that the trick involved in overcoming these technical barriers is well justified by the high payoff potential of the UHV system. DOE

N83-21089# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
SELECTING AND TESTING OXYGEN-MEASURING SYSTEMS FOR FLUIDIZED-BED COMBUSTORS
J. I. Federer Jan. 1983 36 p refs
(Contract W-7405-eng-26)
(DE83-005987; ORNL/TM-8520) Avail: NTIS HC A03/MF A01

The performance characteristics of commercially available oxygen-measuring systems (OMSs) were compared to identify a device for use in fluidized-bed combustors (FBCs). The comparison indicated that only instruments with ceramic electrolytes are capable of making the required measurements. Several sensors were then tested for accuracy and response time in a laboratory apparatus to assess their suitability for FBC use. Because of their physical configuration, two sensors of the type used to measure oxygen in flue gases had responses substantially slower than that required. Sensors of the type used in automobile exhaust systems had significantly faster responses. For the latter sensors the results demonstrated that response time is a function of initial and final oxygen concentrations. The automotive sensor was much less catalytic to reactive gases than were the other sensors. This behavior suggests that the response of ceramic electrolyte sensors in reactive gases can vary from the actual oxygen content to the thermodynamic equilibrium value, the actual response depending on sensor characteristics that affect catalysis. DOE

N83-21090# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
A STUDY OF SOLID METAL/CERAMIC REACTIONS Final Report, 18 Jun. 1979 - 17 Jun. 1982
R. L. Mehan and M. R. Jackson 17 Jun. 1982 149 p refs
(Contract DE-AC02-79ER-10413)
(DE82-021974; DOE/ER-10413/T2) Avail: NTIS HC A07/MF A01

This program is concerned with the solid state reactions between silicon based structural ceramics and a simple model superalloy. The first year of the program was devoted to the examination of the reactions occurring between SiC, Si/SiC, Si3N4, and a model NiCrAl superalloy. The second year was devoted to phase identification using microprobe, X-ray diffraction, transmission electron microscopy, and scanning transmission electron microscopy analysis techniques. By preparing diffusion couples consisting of SiC and Ni, NiCr, and NiCrAl, and reacting them at various temperatures, a satisfactory understanding of the overall reaction mechanism was obtained. The third and final year has been concerned with examining some of the details of the Si3N4/NiCrAl and Si/NiCrAl reactions and comparing the mechanisms to that of the SiC, SiSiC/NiCrAl reaction. It was found that Si3N4 reacted to a lesser extent with the model superalloy than either SiC or Si-SiC, while Si reacted to a far greater extent. Work was also conducted in examining the use of barrier coatings, both metallic and ceramic, in order to minimize these reactions. DOE

N83-21091# Brigham Young Univ., Provo, Utah. Dept. of Chemical Engineering.
COMBUSTION RESEARCH NEEDS Final Report
L. Douglas Smoot and Scott C. Hill Mar. 1982 90 p refs
(Grant NSF-81-SP-1151)
(PB83-107813; NSF/OIR-82002) Avail: NTIS HC A05/MF A01 CSCL 21B

A six month study to survey the state of the art in combustion research is summarized. Included is a review of the literature and discussions on coal gasification, explorations, fires, liquid and solid fossil fuels, reciprocating and turbine engines, and solid propellants. Fundamental combustion areas are examined, including the chemistry of combustible materials, combustor modeling, diagnostics and instrumentation, droplet and gas phase kinetics, and fluid mechanics. Results are presented of a survey of professionals who recommended research needs in the areas of turbulence/fluid mechanics, diagnostics/instrumentation, and combustor modeling. Evaluations of this document by two combustion researchers are included. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N83-21092# Central Electricity Generating Board, London (England).
THE HIGH TEMPERATURE STRENGTH OF AUSTENITIC HEATING CONDUCTOR ALLOYS
H. Franz, H. Pfeiffer, and I. Pfeiffer 27 Oct. 1982 17 p refs Transl. from Z. Metallk. (West Germany), v. 58, no. 2, Feb. 1976 p 87-92
(BLL-CE-Trans-7737-(9022.090)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The strength properties of austenitic heating conductor alloys were determined in short term tests in the temperature range 20 to 1100 C. The tensile strength and yield point do not show any peculiarities. However, the elongation and necking at fracture pass through a minimum at about 600 C which is more pronounced the higher the nickel content of the alloy. This phenomenon is considered to be caused by a hindering of gliding processes and the movement of dislocation during deformation when hot. Electron optical examination of specimens from the hot tensile test at 600 C revealed finely dispersed precipitations of carbides or coherent preliminary stages of these at dislocations and subgrain boundaries. S.L.

N83-21093# Central Electricity Generating Board, London (England). Translations Section, Overseas Service.
TECHNICAL AND ECONOMICAL EVALUATION OF CORROSION LOSSES OF STEEL STRUCTURES IN AGGRESSIVE ATMOSPHERES
M. Kulis 29 Oct. 1982 17 p refs Transl. into ENGLISH from Werkst. Korros. (West Germany), v. 32, 1981 p 79-85
(BLL-CE-Trans-7881-(9022.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Specific costs for procurement and maintenance of light to medium heavy steel structures protected by various coating systems (e.g. hot galvanizing with top coat renewed at regular intervals, sprayed aluminum coating with sealing coat) were surveyed. As an alternative the use of weathering steel is considered. In addition optimum protection variants are considered for atmospheres of defined corrosiveness. S.L.

N83-21094# Central Electricity Generating Board, London (England). Translations Section, Overseas Service.
INTERGRANULAR CORROSION BY LIQUID METALS ON STEELS
W. Raedeker 27 Oct. 1982 21 p refs Transl. into ENGLISH from Werkst. Korros. (West Germany), v. 24, no. 10, 1973 p 851-859
(BLL-CE-Trans-7884-(9022.090)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Zinc, copper, antimony, and cadmium in the molten state produce grain boundary damage in normal ferritic-pearlitic steels. If the harmful metals are dissolved in low melting indifferent metals,

they may also damage the grain boundaries below their own melting point. This damage generally increases as the tensile stress increases, but may be suppressed by too rapid a flow. Even small concentrations of the harmful metal are sufficient to cause its specific effect. No harmful effect was observed with lead and bismuth or manganese, aluminum, arsenic, and nickel dissolved in lead. Although it is probable that highly pure tin is not corrosive, this would have to be checked again in a larger temperature range. S.L.

N83-21095# Central Electricity Generating Board, London (England). Translations Section, Overseas Service.
THE CONNECTION BETWEEN THE PROPERTIES OF A MEDIUM AND THE KINEMATIC ATMOSPHERIC CORROSION OF STEEL, ZINC, COPPER AND ALUMINUM. AN ASSESSMENT OF THE RESULTS OBTAINED OVER FIVE YEARS DURING THE FIRST STAGE OF A PROGRAMME OF CORROSION TESTS CARRIED OUT BY MEMBER COUNTRIES OF THE COUNCIL FOR MUTUAL ECONOMIC AID
K. Barton 27 Oct. 1982 16 p Transl. into ENGLISH from Zashch. Metal. (USSR), v. 16, no. 4, 1980 p 387-395
(BLL-CE-Trans-7770-(9022.90)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The results of a five year program of corrosion tests carried out, is to establish correlated relationships between long term variations in the atmospheric corrosion rates of the main metals used in engineering (steel, zinc, copper and aluminum) and the quantitative characteristic features of the atmosphere. B.G.

N83-21096# Central Electricity Generating Board, London (England).
EVALUATION OF THE TENDENCY TO HOT CRACKING IN THE ZONES AFFECTED BY WELDING IN 18-10 AUSTENITIC STAINLESS STEELS. DISCUSSION OF A CRACKING CRITERION
J. R. Donati and G. Zacharie 26 Oct. 1982 24 p refs Transl. into ENGLISH from Rev. Met. (Paris), Dec. 1974 p 905-915
(BLL-CE-Trans-7552-(9022.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

One of the causes of intergranular cracking is the presence, in the grain boundaries, of alloying elements or impurities which locally reduce the melting point. In the course of heating to a high temperature during welding, intergranular gaps may appear in zones which have melted under the effect of shrinkage stresses. One of the experimental methods which was developed for studying this phenomenon is the Gleeble machine, which can be used to measure the hot ductility of the metal during thermal cycles which simulate the effect of welding,. By using this test on materials whose welding behavior was well known, its interpretation was defined more accurately, and a criterion suited to the type of cracking studied was determined. Other devices, more technological in nature, were also developed to investigate the tendency to hot cracking; this is particularly the case with the Varestraint test, which consists of inducing cracking by bending on a test piece during welding. S.L.

N83-21097# Central Electricity Generating Board, London (England).
REHEAT CRACKING IN WELDMENTS, 3
Shogo Kanazawa, Kazunari Yamato, and Tetsujiro Takeda 27 Oct. 1982 13 p refs Transl. into ENGLISH from Yosetsu Gakkaishi (Japan), v. 46, no. 8, 1977 p 592-597
(BLL-CE-Trans-7777-(9022.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Factors responsible for reheat cracking were investigated, and in view of the fact that reheat cracking comprises intergranular cracking at elevated temperature, the relation of crack susceptibility to the high temperature rupture strength of the heat affected zone was considered. It was shown that the fracture surface in high temperature tensile tests on the HAZ resembled a reheat fracture surface, and the welds of high rupture strength generally had low crack susceptibility. Having established that high temperature strength in the HAZ is a factor governing reheat cracking. Stress relaxation characteristics were investigated. It was found that the stress relaxation characteristics of the base metal also govern reheat crack susceptibility. S.L.

N83-21098# British Library Lending Div., Boston Spa (England).
CASE HARDENING OF SINTERED IRON POWDER PRODUCTS DURING RAPID ELECTRIC HEATING
L. V. Boiko and V. I. Andryushechkin 13 Dec. 1982 4 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Metall. (USSR), v. 11, 1981 p 117-120
(BLL-M-26840-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The carburizing of sintered powder specimens of carbonyl iron and reduced iron with high and low oxide contents was investigated. For comparison, tests were also conducted on compacted powder iron. The use of rapid electric heating enabled the process of carbon saturation of powder sintered iron to be substantially increased. Data on the depth of carburization achieved, the nature of the layer matrix interface and structures present are given. Author

N83-21099# British Library Lending Div., Boston Spa (England).
STATISTICAL CONTROL OF THE SUSCEPTIBILITY OF TYPE Kh18N10T STEELS TO INTERGRANULAR CORROSION
E. V. Butskii, A. M. Uglova, L. N. Kultygina, and M. M. Klyuev 13 Dec. 1982 9 p refs Transl. into ENGLISH from Stal (USSR), v. 11, 1981 p 76-78
(BLL-M-26824-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Statistical control of the susceptibility of O8-12Kh18N1OT steels to intergranular corrosion was worked out and brought into use on the basis of research. This has reduced the outlay on producing specimens and on carrying out tests, and has accelerated the dispatch of metal to customers. Author

N83-21100# British Library Lending Div., Boston Spa (England).
BOOK REVIEW: THE ELECTRON-BEAM MELTING OF METALS
V. I. Kashin 20 Dec. 1982 5 p Transl. into ENGLISH from Stal (USSR), v. 12, 1981 p 45-46
(BLL-M-26862-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Electron beam melting of metals in furnaces is discussed. Special features of the heating and solidification of metals, the mechanism and kinetics of vaporizing impurities out of the metals during remelting, degasification of molten metal, and the economic effectiveness of using electron beam remelting in the production of ferrous metals are discussed. R.J.F.

N83-21101# British Library Lending Div., Boston Spa (England).
WEAR RESISTANCE OF CAST IRON OBTAINED BY SPHEROIDIZING TREATMENT IN THE FOUNDRY MOULD
N. V. Chernyshova and G. I. Ezhov 13 Dec. 1982 3 p Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Metall. (USSR), v. 11, 1981 p 157-158
(BLL-M-26853-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

A brief account is given of comparative tests on one composition of cast iron which showed that a material of better wear resistance is obtained if the spheroidizing treatment is carried out in the mould rather than the ladle. Author

N83-21102 British Library Lending Div., Boston Spa (England).
PROTECTIVE COATINGS AGAINST FRETTING IN AIRCRAFT ENGINE CONSTRUCTION
R. Scharwaechter and A. Sickinger 6 Jan. 1983 14 p refs Transl. into ENGLISH from Tech. Zentral. Prakt. Metall. (USSR), v. 72, no. 8, 197 p 45-48
(BLL-CE-Trans-7736-(9022.09)) Avail: British Library Lending Div., Boston Spa, England

The large number of positive and friction drives in aircraft engines encourages the occurrence of fretting. The wear process involved and those components most affected by wear are considered. Protective coatings are described which are suitable

as preventive protection against fretting, as well as for repairing components already worn by fretting. A description is also given of various methods by which these coatings are applied. S.L.

N83-21103# British Gas Corp., London (England).
KINETICS OF H-INDUCED STRESS CORROSION CRACKING. PART 1: IMPORTANT FEATURES OF CRACKING IN RESPECT OF HIGH STRENGTH STEELS
B. Stellwag and H. Kaesche 16 Dec. 1982 12 p Transl. into ENGLISH from Wekst. Korros. (West Germany), v. 33, 1982 p 274-280
(BLL-T6004/BG/HQ/82-(9022.04)) Avail: British Library Lending Div., Boston Spa, Engl.

H-induced stress corrosion cracking with a suitable material was investigated to discover the basic mechanism that causes the damage and to clarify the kinetics of the growth of the crack. It is known that materials made of steel and iron are susceptible to the embrittling action of hydrogen and for this reason the test material chosen was a high strength, iow alloyed steel; the test procedure was in the field of fracture mechanics. Some important factors concerning H induced cracking are laid out and conclusions are drawn from these. L.F.M.

N83-21104*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE STRESS-CORROSION BEHAVIOR OF Al-Li-Cu ALLOYS: A COMPARISON OF TEST METHODS
Patrick P. Pizzo (San Jose State Univ.), Ray P. Galvin, and Howard G. Nelson Sep. 1982 46 p refs
(NASA-TM-84287; A-9057; NAS 1.15:84287) Avail: NTIS HC A03/MF A01 CSCL 11F

The stress-corrosion (SC) behavior of two powder metallurgy processed (Al-Li-Cu) alloys with and without Mg addition in aqueous 3.5% NaCl solution has been investigated. Three test techniques were employed in the investigation: the alternate immersion testings of tuning fork specimens, slow crack-growth tests using fracture-mechanics specimens, and the slow strain-rate testing of straining electrode specimens. The corrosion conditions investigated include cathodic and anodic potentiostatic control and free-corrosion under constant-immersion and alternate-immersion conditions. The heat treatment and the orientation of the alloys were varied to establish the more susceptible material conditions. Scanning electron microscopy and optical metallography were used to demonstrate the character of the interaction between the Al-Li-Cu alloys and the selected environment. Both Al-Li-Cu alloys are susceptible to SC in an aqueous 3.5% NaCl solution under the right electrochemical and microstructural conditions. Each test method was found to yield important information on the character of the SC behavior. Under all conditions investigated, second-phase particles strung out in rows along the extrusion direction in the alloys were rapidly attacked, and they play a principal role in the SC process. B.W.

N83-21105*# National Aeronautics and Space Administration, Washington, D. C.
KINETICS AND MECHANISM OF THE OXIDATION PROCESS OF TWO-COMPONENT Fe-Al ALLOYS
Hanna Przewlocka and Jolanta Siedlecka Dec. 1982 22 p refs Transl. into ENGLISH from Arch. Hutn. (Poland), v. 26, no. 1, 1981 p 147-163 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Czestochowa Polytechnics, Poland
(Contract NASw-3542)
(NASA-TM-77009; NAS 1.15:77009) Avail: NTIS HC A02/MF A01 CSCL 11F

The oxidation process of two-component Fe-Al alloys containing up to 7.2% Al and from 18 to 30% Al was studied. Kinetic measurements were conducted using the isothermal gravimetric method in the range of 1073-1223 K and 1073-1373 K for 50 hours. The methods used in studies of the mechanism of oxidation included: X-ray microanalysis, X-ray structural analysis, metallographic analysis and marker tests. Author

N83-21106# Central Electricity Generating Board, London (England). Translation Section.
EFFECTS OF CYCLIC LOAD AND TEMPERATURE ON CREEP CRACK GROWTH RATE IN 2024 ALUMINUM ALLOY
M. Shiga [1982] 14 p refs Transl. into ENGLISH from Zairyo (J. Soc. Mater. Sci. Japan) Japan, v. 28, no. 308, 1979 p 407-413 Previously announced as A79-43868
(CE-Transl-7764) Avail: NTIS HC A02/MF A01

The effects of cyclic loading and temperature upon the creep crack growth rate of 2024 aluminum alloy were investigated. Crack growth rates with time, effect of temperature on creep crack growth rates, crack propagation behavior under cyclic loading, the effect of temperature on fatigue crack growth rate, and the relation between crack growth rate and frequency were plotted. The test results are summarized as follows: (1) the creep crack growth rate increases with increasing testing temperature, and the apparent activation energy of creep crack growth decreases in the range from 26 to 32 kcal/mol with decreasing stress intensity factor; (2) the crack growth rate in the range of creep-fatigue interaction can be estimated on the basis of the linear damage rule. A.T.

N83-21107# Tin Research Inst., Inc., Columbus, Ohio.
TIN AND ITS USES, NO. 135 Quarterly Report
Colin J. Evans, ed. 1983 22 p
(ISSN-0040-7941) Avail: NTIS HC A02/MF A01

Tin usage is discussed in relation to soldering, tinplate and tin chemicals. Market development was also discussed. Developments in the principal tin using industries was described. S.L.

N83-21108# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
CORROSION CRACK INITIATION AT GROWING PITS ON TYPE 304 STEEL UNDER PULSATING LOAD
S. Tsujikawa and Y. Hisamatsu 1983 25 p refs Transl. into ENGLISH from Nihon Kinzoku Gakkaishi (Japan), v. 41, no. 8, 1977 p 829-837
(NRC/CNR-TT-2050; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

Rotary bending fatigue tests of Type 304 steel in IN H2SO, containing 0.5 M NaCl at 25 C were conducted in order to study the corrosion crack initiation at the site of a growing pit, in comparison with that in the active potential range. Cracks are found to initiate even at a potential at 0.42V which is more noble than the critical pitting potential, Vc=0.41 V9SCE). In the study of the crack initiation at the pits growing at the potentials less noble than Vc, the following procedures were adopted. The precracks with appropriate depth, which had been introduced into the specimen at =0.45V, developed into hemispherical pits and continued to grow at the passive potentials. Such growing pits are considered to be equivalent to the natural pits growing in the same potential range. The occurrence of crack initiation at the bottom of the growing pits increased markedly in the potential range between 0.1 and 0.3 V under the condition of potential descent at the sweep rate of 240 min/V. The fact that the less noble the potential the less deep pits issue cracks could be explained from the requirement that initiating crack must have a growth rate higher than the dissolution rate at the pit bottom.
Author

N83-21109# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
CORROSION CRACK INITIATION IN THE ACTIVE POTENTIAL RANGE IN TYPE 304 STEEL UNDER PULSATING LOAD
S. Tsujikawa and Y. Hisamatsu 1983 22 p refs Transl. into ENGLISH from Nihon Kinzoku Gakkaishi (Japan), v. 41, no. 8, 1977 p 823-829
(NRC/CNR-TT-2049; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

Chloride stress corrosion cracking (SCC) of type 304 (stainless) steels actually commences in the form of a pitting attack. The most important task was to determine what conditions cause the cracks to develop from the corrosion pits. Electrochemical conditions play an increasingly important role in SCC. B.G.

N83-21110*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SLIDING INDUCED CRYSTALLIZATION OF METALLIC GLASS
Kazuhisa Miyoshi and Donald H. Buckley Mar. 1983 23 p refs (NASA-TP-2140; E-1278; NAS 1.60:2140) Avail: NTIS HC A02/MF A01 CSCL 11F

Sliding friction and wear experiments, electron microscopy, and diffraction studies were conducted with an Fe67Co18B14Si1 ferrous-base metallic glass in sliding contact with aluminum oxide at room temperature in air. The results indicate that the amorphous alloy can be crystallized during the sliding process. Crystallization of the wear surface causes high friction. Plastic flow occurred on the amorphous alloy with sliding, and the flow film of the alloy transferred to the aluminum oxide surface. Two distinct types of wear debris were observed as a result of sliding: an alloy wear debris, and powdery and whiskery oxide debris. Generation of oxide wear debris particles on an alloy can cause transitions in friction behavior. Author

N83-21111# Battelle Columbus Labs., Ohio.
REVIEW OF THE LOW-TEMPERATURE PROPERTIES OF METALS. REVIEW OF CRACK ARREST TOUGHNESS OF 9-NI STEEL OPERATING AT CRYOGENIC TEMPERATURES
M. Landow, ed. and F. Jelinek, ed. Mar. 1982 6 p refs Sponsored in part by Metal Properties Council
(Contract DLA900-78-C-1715)
Avail: NTIS HC A02/MF A01

Crack arrest toughness of 9-Ni steels is discussed along with descriptions of the various approaches and testing method. Basically, the tests performed can be divided into categories: those which are based on fracture mechanics concepts and those which are not. An overview of the fracture toughness concepts including both linear-elastic and elastic-plastic fracture mechanics along with a summary of the concept of crack arrest toughness methodology and testing is presented. A summary of the nonfracture mechanics oriented tests which include drop-weight, explosion bulge, and dynamic tear are presented. Tabulations of recently published crack initiation test data for 9-Ni steel are given. With most of the data being generated from the wide-plate tests. R.J.F.

N83-21112# British Library Lending Div., Boston Spa (England). Overseas Service.
RED-SHORTNESS OF STEEL CAUSED BY METALS
H. Schottky [1982] 22 p refs Transl. into ENGLISH from Arch. Eisenhettenw. (West Germany), v. 4, no. 11, May 1931
(BLL-CE-Trans-7909-(9022.09)) Avail: NTIS HC A02/MF A01

Hot bending tests with sprinkling and after immersion into liquid metal were used to study the red shortness of steel caused by tensile stress and simultaneous contact with metals. The conditions for the occurrence of red shortness was determind to be: (1) the direct contact of the steel with an alloy which is at least partially liquid; (2) the alloy or its main component must be soluble in iron or the iron in the alloy; and (3) the existence of sufficiently high tensile stress in the steel wetted with metal. All metals and alloys meeting condition 2 generate red shortness. The fracture is created by intercrystalline penetration of the metal into the steel. The period of time that the liquid metal acts on the unstressed steel has no effect on the degree of red shortness. Red shortness increases with increasing temperature and is independent of the carbon content and the space lattice state of the steel. Alloyed steels show special characteristics with respect to alloys causing red shortness which deviate greatly from those of carbon steels. A.R.H.

N83-21113# British Library Lending Div., Boston Spa (England).
NEW CONSIDERATIONS IN CATHOLIC CORROSION PROTECTION
Walter V. Baeckmann British Gas 1982 16 p refs Transl. into ENGLISH from GWF Gas-Erdgas (West Germany), v. 123, no. 10/11, 1982 p 530-536
(BLL-T5966) Avail: British Library Lending Div., Boston Spa, Engl.

Four influences on the potential measurement in cathodic corrosion protection and their possible elimination are described. These are: eddy current through magnetic changes in the Earth's magnetic field and/or through industrial direct current generators, ohmic voltage decreases at failures, and equalizing currents in the case of variable polarization. The consequent measurement errors in the potential measurement can be excluded by synchronous recordings and comparison when the direct current generator is shut down, and also by potential measurement with firmly embedded electrodes, recessed electrodes, and electronic storage amplifier plus by voltage decrease estimate after measurement of the voltage decreases at failures vertically to the pipeline. S.L.

N83-21114# British Library Lending Div., Boston Spa (England).
ANODIC BEHAVIOUR AND CORROSION OF TITANIUM IN METHANOLIC SOLUTIONS
F. Mazza British Gas 1982 12 p refs Transl. into ENGLISH from Werkst.-Korros. (Italy), v. 20, no. 3, 1969 p 199-205
(BLL-T6022/BG/HQ/83) Avail: British Library Lending Div., Boston Spa, Engl.

The anodic behavior of titanium in methanolic solutions in the presence of halides and water in different concentrations was investigated. The influence of some electrochemical, mechanical and chemical factors upon the intercrystalline corrosion of titanium was established. S.L.

N83-21115# British Library Lending Div., Boston Spa (England).
HIGH-TEMPERATURE SHAPE MEMORY EFFECTS IN TINI-TIPd SYSTEM ALLOYS
V. N. Khachin, N. M. Matveeva, V. P. Sivokha, D. B. Chernov, and Yu. K. Kovneristyj British Gas 1982 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 257, no. 1, 1981 p 167-169
(BLL-T5936/BG/WH739/82) Avail: British Library Lending Div., Boston Spa, Engl.

High temperature memory effects were obtained. The shape memory effects were due to anomalously high reversible deformation, which occurs mainly in martensite transformations. Consequently, the temperature at which memory is exhibited is determined by the martensite transition range, and the value and reversibility of martensite deformation by the crystallography of the transformation and by the elastic properties of the alloy. The clearly marked, but low temperature, memory effects in known systems, and particularly, in TiNi, are associated mainly with transformation of the highly symmetrical B2 phase into a low symmetrical structure close to B19. At high temperature, the analogous transformation B2 yields B19 is observed in TiPd. S.L.

N83-21116# United Technologies Research Center, East Hartford, Conn.
STUDY OF THE DEPENDENCE OF MICROSEGREGATION ON CRITICAL SOLIDIFICATION PARAMETERS IN RAPIDLY-QUENCHED STRUCTURES Annual Technical Report, Oct. 1981 - Sep. 1982
Edward M. Breinan and David B. Snow Oct. 1982 53 p refs
(Contract N00014-79-C-0649; NR Proj. 031-825)
(AD-A122539; UTRC/R82-915797-2) Avail: NTIS HC A04/MF A01 CSCL 20/11

Laser welds of 1.27 and 2.54 cm thick Ti-6Al-4V (wt%) plate separated by a 4 mm straight-sided gap were achieved with the aid of the addition of solution blend Ti-6Al-4V powder to the weld gap (the powder-feed LAYERGLAZE process). A continuous CO2 laser was utilized in the unstable resonator mode with a set beam power of 5 kW, focused by a copper mirror of 45.7 cm focal length. Each successive layer of feedstock filled the gap width, and was overlaid by another until the gap was filled. Ambient temperature tests of cross-weld tensile and impact specimens revealed no fusion zone strength reduction but a somewhat decreased toughness with respect to the annealed base metal. The average fusion zone microhardness was 417 VHN vs 342 outside the HAZ, due primarily to an increase in oxygen content in the fusion zone. The fusion zone grain structure was distinctively columnar, with grains traversing many successive deposited layers.

No grain boundary alpha phase was detected; the grains consisted entirely of fine alpha HCP martensite, internally twinned and faulted, with a wide range of lath lengths and a high dislocation density. No grain boundary or interdendritic segregation was detected by TEM/STEM EDS analysis. Author (GRA)

N83-21117# Denver Univ., Colo. Dept. of Physics.
AN INVESTIGATION OF THE EFFECTS OF METALLURGICAL AND/OR TESTING VARIABLES ON THE ACOUSTIC EMISSION FROM CRYSTALLINE MATERIALS Final Technical Report, 1 Aug. 1977 - 31 Jan. 1982
Steve H. Carpenter Sep. 1982 79 p refs
(Grant AF-AFOSR-3395-77; AF Proj. 2306)
(AD-A121715; AFOSR-82-1003TR) Avail: NTIS HC A05/MF A01 CSCL 11/6

The goal of this investigation was to characterize and correlate the acoustic emission measured during deformation with the responsible deformation mechanisms. Two separate and distinct classes of materials have been investigated. The materials were chosen for the important fundamental information they could provide concerning the relationship between acoustic emission and the parameters involved and because of their practical importance to Air Force programs and objectives. The materials investigated were: one, a selection of precipitation strengthened metals and alloys, and two, a selection of metals and alloys having a hexagonal close packed structure. For both classes of materials the acoustic emission has measured during deformation for different metallurgical and testing parameters. The data have been analyzed and models and/or deformation mechanisms responsible for the measured emission have been identified. GRA

N83-21118# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.
DEVELOPMENT OF HIGH MODULUS CORROSION RESISTANT ALUMINUM ALLOYS Final Report, 31 Aug. 1980 - 30 Jul. 1981
Michael J. Koczak Mar. 1982 82 p refs
(Contract N62269-80-C-0295)
(AD-A122167; NADC-80100-60) Avail: NTIS HC A05/MF A01 CSCL 11/6

A program of basic research has been undertaken with the overall goal of establishing quantitative processing-microstructure-mechanical behavior relationships in fully-dense duplex Al-Zn-Mg-Al-Mn alloys produced by powder metallurgy. Initial attention has been directed to powder processing, consolidation, mechanical property and corrosion response. Microstructures have been characterized in the powder, hot compacted billets, forgings and extrusions. Mechanical properties of primary interest were modulus, strength, impact and ductility. The goal of this highly exploratory program was to develop a duplex, aluminum alloy in which an MnAl6 aluminide dispersant phase provided for modulus/strength contributions, while the Al-Zn-Mg matrix imparted ductility and toughness. GRA

N83-21119# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STANDARD METHOD FOR ANALYZING GASES IN TITANIUM AND TITANIUM ALLOYS AND STANDARD METHOD FOR THE CHEMICAL ANALYSIS OF TITANIUM ALLOYS
28 Oct. 1982 104 p Transl. into ENGLISH of an unidentified Chinese language article by the Beijing Inst. of Aviation Materials p 1-18, 1-62
(AD-A122805; FTD-ID(RS)T-0995-82) Avail: NTIS HC A06/MF A01 CSCL 11/6

Chemical analysis to determine the percentage content of the following metals (aluminum, vanadium, molybdenum, tin, zirconium, iron, silicon, manganese, chromium, copper, boron, and cerium) in titanium alloy chemical components used in aviation was presented. B.G.

N83-21120# Ames Lab., Iowa.
TRANSFORMATION VOLUME CHANGE IN EQUIATOMIC NICKEL-TITANIUM HYDROSTATIC WEIGHING
C. H. Hsu, M. S. Wechsler, and H. Diehl Apr. 1982 30 p refs
(Contract W-7405-eng-82)
(DE83-003818; IS-4799) Avail: NTIS HC A03/MF A01

Direct hydrostatic weighing experiments were conducted on cooling from 1000 C to near room temperature in methylene iodide liquid in order to measure the transformation volume change in equiatomic nickel-titanium. The density of the methylene iodide was determined from separate weighings of standard silicon and nickel samples. The volume of the Ni-Ti was observed to increase by about 0.2% upon transformation on cooling, consistent with increases in length detected by strain gage measurements. The observed volume increase upon transformation on cooling is inconsistent with the volume decrease of about 0.5% predicted by lattice parameter determinations for the transformation from the B2 austenite phase to the distorted B19 martensite phase. As a tentative explanation from the discrepancy, it is suggested that the transformation product is at least partly the intermediate premartensitic rhombohedral R phase. DOE

N83-21121# California Univ., Livermore. Lawrence Livermore Lab.
VARIATION OF THE YIELD STRENGTH AND STRAIN-RATE SENSITIVITY EXPONENT OF TYPE 21-6-9 STAINLESS STEEL OVER A WIDE TEMPERATURE RANGE
M. E. Kassner 15 Nov. 1982 7 p refs
(Contract W-7405-eng-48)
(DE83-003310; UCID-19597) Avail: NTIS HC A02/MF A01

The yield strength of solution annealed 21-6-9 austenitic stainless steel was determined over a wider temperature range (-95 to 1100 C) than has been previously reported. The most noteworthy characteristic of the variation of yield stress with temperature was the dramatic decrease in yield strength from -1950 C to 3000 C. The strain rate sensitivity exponent, N, was determined using strain rate change tests. A plot of N vs temperature showed that n dramatically increased at about 8500 C and that N is approximately independent of strain (structure). DOE

N83-21122# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
HYDROGEN ATTACK OF STEELS Final Summary Report, 1 Apr. 1976 - 31 Mar. 1982
Paul G. Shewmon Nov. 1982 8 p
(Contract DE-AC02-76ER-02872)
(DE83-003358; DOE/ER-02872/05) Avail: NTIS HC A02/MF A01

A capacitance dilatometer was used to follow the kinetics of the earliest stages of bubble growth in hydrogen attack (HA) on steels. A high density of bubbles developed along some grain boundaries, with a spacing of 2 to 3 SIGMA m. Mechanisms for growth of grain boundary voids in creep (diffusion of Fe along grain boundary or bubble surfaces) can be used to describe the kinetics of early stages of HA. Equilibrium methane pressures are established inside the bubbles in a few hours. The number of bubbles that will grow all develop in a small fraction of the incubation time, and they nucleate on grain boundary (GB) carbides, ferrite/pearlite GB, or in higher-sulfur steels, at MnS inclusions. The bubbles form on only some of the grain boundaries in a steel undergoing HA. DOE

N83-21123# Oak Ridge Y-12 Plant, Tenn. Management Technology Dept.
DEVELOPMENT OF A SILICATE-NITRITE-BORATE CORROSION INHIBITOR
P. A. Taylor 29 Nov. 1982 11 p
(Contract W-7405-eng-26)
(DE83-003297; Y-2283) Avail: NTIS HC A02/MF A01

A corrosion inhibitor consisting of 1000 mgL nitrite (NO2(+)), 500 mgL silicate (SiO2), 300 mgL boron as a pH buffer, 50 mgL of a biocide, and 5 mgL tolyltriazole in deionized water was developed for use in the machine-cooling water system of the Department of Energy's Gas Centrifuge Enrichment Plant (GCEP) at Portsmouth, Ohio. Corrosion tests in this solution using six different types of metals, including 6061 aluminum, failed to show

any corrosion at the 0.05-(SIGMA) y (0.002-mily) detection limit. The use of deionized water for this inhibitor solution is strongly recommended for any system containing aluminum because the presence of 30 mgL of chloride ions is known to cause pitting in 6061 aluminum. The purity of the corrosion inhibitor can be maintained by using a small mixed-bed demineralizer in the water system. The demineralizer originally loads up with sodium and slicate ions, which then exchange for any contaminating ions-such as calcium, magnesium, or chromate-that might enter the corrosion-inhibitor solution. DOE

N83-21124# Northeastern Univ., Boston, Mass.
EQUILIBRIUM AND TRANSPORT PROPERTIES OF DISORDERED TRANSPORT AND NOBLE-METAL ALLOYS, AND TRANSPORT PROPERTIES OF DISORDERED ALLOYS Final Report, 1 Feb. 1980 - 31 Jan. 1982
P. N. Argyres and A. Bansil Mar. 1982 14 p
(Contract DE-AC02-78ER-04720)
(DE83-003077; DOE/ER-04720/1) Avail: NTIS HC A02/MF A01

A method was introduced for the formulation of the single site approximations for both the equilibrium and transport properties of random alloys. This method uses a projection operator to denote the ensemble average and can formulate the average t matrix and coherent potential approximations along entirely parallel lines for both equilibrium and transport properties. DOE

N83-21125# Mound Lab., Miamisburg, Ohio.
TENSILE STRENGTH AS A FUNCTION OF THERMAL HISTORY OF INCONEL 718 AND INCONEL 625 ALLOYS FOR GLASS-CERAMIC HEADERS
Michael C. Rey and William R. Henderson 11 Jun. 1982 8 p refs
(Contract DE-AC04-76DP-00053)
(DE83-000061; MLM-2944) Avail: NTIS HC A02/MF A01

Tensile strength tests were conducted on Inconel 718 specimens following a variety of heat treatments, and on as-received and heat-treated specimens of Inconel 625. A heat treatment cycle for Inconel 718 was found that represents metal and one that least taxes a glass-ceramic material to which the Inconel 718 is bonded. Heat treating resulted in a moderate decrease in the tensile strength of the as-received Inconel 625. DOE

N83-21126# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
IRRADIATION OF TUNGSTEN WITH METALLIC DIATOMIC MOLECULAR IONS: ATOMIC RESOLUTION OBSERVATIONS OF DEPLETED ZONES
D. Pramanik and D. N. Seidman Aug. 1982 18 p refs Sponsored in part by National Science Foundation
(Contract DE-AC02-76ER-03158)
(DE83-001862; DOE/ER-03158/104; Rept-4801) Avail: NTIS HC A02/MF A01

Direct evidence, on an atomic scale, for the enhancement of damage production per projectile ion in diatomic metallic molecular ion irriadiations of tungsten as compared to monatomic metallic ion irradiations is presented. Irradiations were performed in situ at less than or equal to 10 K, in a field ion microscope. In the near surface region the depleted zones produced by the W2( ) dimer ions give rise to void like contrast effects. The W( ) monomer ions do not produce this void like damage. The existence of voids was explained nucleation and diffusion limited growth model which suggests that the growth can occur on a time scale < 10 (+9)s, if the effective diffusivity of an atom in the full developed collision cascade is 3 x 10(+4)cm(2)s(+1). By counting the number of vacancies in individual depleted zones, produced by the different ions, is demonstrated that the number of vacancies produced per incoming ion of the dimer is 1.55 times greater than the number of vacancies produced per monomer ion. DOE

N83-21127# California Univ., Berkeley. Dept. of Material Sciences and Mineral Engineering.
LOW-ALLOY STEELS FOR THICK-WALLED PRESSURE VESSELS Final Report, 1 Oct. 1978 - 31 Mar. 1980
J. A. Todd, V. F. Zackay, and E. R. Parker 1980 85 p refs
(Contract DE-AT03-76ET-10699)
(DE83-002547; DOE/ET-10699/T1) Avail: NTIS HC A05/MF A01

This program aims to modify existing commercially available pressure vessel steels and to develop new steels which can be field fabricated into thick sectioned pressure vessels for coal gasification and liquefaction systems. During 1978-79, transmission electron microscopy has been carried out on 2.25CR-1Mo, samples of which have been cooled at rates simulating those obtained in commercial plates up to 16 in. thick. The tempering responses at different temperatures have also been fully characterized. These studies were repeated on the alloy modifications. Programs have been developed to eliminate temper embrittlement in 2.25Cr-1Mo and also in 3.5Ni-1.5Cr steels and a study of the microstructural aspects of weldability has also been initiated. Fracture mechanics studies have been initiated on A533B and its alloy modifications. Isothermal transformation of Alloy 4 (Fe-0.1%C-0.5V-0.5Mn) and Alloy 5 (Fe-0.1C-0.5V-0.5Mn-3Ni) showed that uniform VC particle dispersions with optimum strength and toughness properties could be achieved in Alloy (i.e., by addition of 3%Ni). DOE

N83-21128# Oak Ridge National Lab., Tenn. Chemical Technology Div.
MASS TRANSFER IN A BUBBLE-AGITATED LIQUID-LIQUID SYSTEM WITH APPLICATIONS TO METAL PURIFICATION BY SLAGGING
S. D. Clinton and J. J. Perona May 1982 36 p refs
(Contract W-7405-eng-26)
(DE82-014569; ORNL/TM-7765) Avail: NTIS HC A03/MF A01

Mass Transfer coefficients between a mercury layer and an aqueous layer agitated by gas bubbles were measured by a polarographic method. The effects of gas rate, vessel size, and sparge-tube diameter were studied. The Schmidt number of the aqueous phase was varied by the use of sugar solutions. The data are well represented by N/sub Sh/ = 1.33N/sub RE/ (0.70) N/sub Sc/sup 1/3/. The effect of gas sparging on the rate of mass transfer was reviewed for slagging operations involving the purification and recycle of metals. Natural convection may cause rapid mass transfer in small systems, such as ladles, whereas in large systems such as hearth furnaces gas sparging should significantly increase the rate of mass transfer. DOE

N83-21129# Hanford Engineering Development Lab., Richland, Wash.
THE 12Cr-1Mo STEEL FOR FISSION AND FUSION APPLICATIONS
D. S. Gelles Mar. 1982 16 p refs Presented at the Intern. Conf. on Ferritic Steels for High Temp. Appl., Warren, Pa., 6-8 Oct. 1981 Submitted for publication
(Contract DE-AC06-76FF-02170)
(DE82-012500; HEDL-SA-2306-FP; CONF-811069-3) Avail: NTIS HC A02/MF A01

A 12Cr-1Mo martensitic stainless steel was selected as a candidate material for both Liquid Metal fast Breeder duct applications and Tokamak Fusion Reactor first wall applications. As such, it represents the ferritic stainless steel alloy class for use as structural components in advanced energy systems. The bases for selecting 12Cr-1Mo for these applications are described and results are presented describing the irradiation resistance of this material following irradiation to high fluence in a fast reactor environment. Discussion is centered on anticipated temper embrittlement response in this class of materials. DOE

N83-21130# Electric Power Research Inst., Palo Alto, Calif. Materials Support Group.
TOUGHNESS OF Cr-Mo-V STEELS FOR STEAM-TURBINE ROTORS
R. Viswanathan and R. I. Jaffee Apr. 1982 38 p refs
(DE82-904-42; EPRI-RD-2357-SR) Avail: NTIS HC A03/MF A01

Chromium-Mo-V steels are used extensively as the rotor material in the high pressure and intermediate pressure sections of modern steam turbines. The toughness of these rotors has a

major influence on the reliability and efficiency of the turbine and the overall economy of operation and maintenance of the plant. the metallurgical factors affecting the toughness of the rotors and the methods to improve the toughness are understood better than ever before. A broad overview of the materials and design aspects of the toughness of Cr-Mo-V rotors with emphasis on the salient results of research programs aimed at improving their toughness is presented. DOE

N83-21131# Sandia Labs., Albuquerque, N. Mex.
TRAPPING AND SURFACE PREMEATION OF DEUTERIUM IN HELIUM-IMPLANTED STAINLESS STEEL
S. M. Myers and W. R. Wampler 1982 15 p refs Presented at the 5th Intern. Conf. on Plasma Surface, Gatlinburg, Tenn., 3-5 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-014090; SAND-82-0013C; CONF-820545-6) Avail: NTIS HC A02/MF A01

Austenitic stainless steel was ion implanted with deuterium (D) and H and then heated, with the depth distribution of D being monitored via the nuclear reaction D-2 (Se-3, p) He-4. Analysis using diffusion theory indicates that D is bound to He-associated traps with an enthalpy of 0.42 +- 0.08 eV referenced to a solution site. The trapping entities are believed to be approximately 1 nm He bubbles observed by transmission electron microscopy, with D being bound to the bubble walls by a mechanism similar to chemisorption. Irradiation-defect traps, probably vacancies, exhibited a strength of only 0.22 +- 0.08 eV. Trapping behavior was essentially the same for types 304 and 310 stainless steel, indicating little dependence upon the stability of the austenitic (fcc) phase. The rate of D release at the surface was determined in the temperature range 425 K to 575 K for two kinds of surface, one oxidized by electropolishing and air exposure, the other sputtered with Fe ions. Release was proportional to the square of solution concentration in both cases, but the recombination coefficient was > 100 times greater for the sputtered surface. DOE

N83-21132# Sandia Labs., Albuquerque, N. Mex. Materials Development Div.
ROLL EXTRUSION OF ALUMINUM ALLOY 6061. EFFECTS OF COLD REDUCTION AND HEAT TREATMENT
Morris Mote Feb. 1982 17 p
(Contract DE-AC04-76DP-00789)
(DE82-012236; SAND-81-8035) Avail: NTIS HC A02/MF A01

A tubular part over a meter long and nearly a half meter in diameter with several different internal diameters was made by internal roll extrusion, achieving external dimensions without subsequent machining and requiring only local machining internally. Excellent mechanical properties were obtained. In addition, an experiment was completed demonstrating a variety of properties achieved by variations in cold reduction and heat treatment. DOE

N83-21133# Wayne State Univ., Detroit, Mich.
PHOTOCHEMICAL ACTIVATION AND REACTIVITY OF POLYNUCLEAR TRANSITION-METAL-COMPLEX MOLECULES Progress Report, Jun. 1981 - 31 May 1982
J. F. Endicott and R. L. Lintvedt Jan. 1982 11 p refs
(Contract DE-AS02-78ER-04685)
(DE82-011850; DOE/ER-04685/1-82) Avail: NTIS HC A02/MF A01

Significant results obtained during the year are summarized for the following programs: (1) reversible, two electron transfer at a single potential in binucler complexes; (2) photophysics of polyketonate complexes; (3) synthetic strategies and characterization of heavy metal heterobinuclear complexes; and (4) high yield synthesis of ligands capable of binding 3 and 4 metal ions per molecule. Electrochemical studies have uncovered a number of binuclear metal complexes that undergo reversible two electron reduction at single potential including Cu(II) complexes with two different coordination environments, mixed Ni(II), Cu(II) complexes and binuclear Ni(II) complexes. In each case the species that exhibit these electron transfer properties were shown to be Na(+) ion paired complexes. Several trinuclear molecular complexes were prepared and characterized that contain two UO2(2+) ions and one transition metal ion. The electrochemistry, absorption spectra, and luminescence were investigated. DOE

N83-21134# Sandia Labs., Albuquerque, N. Mex. Geomechanics Div.
A STUDY OF THE FORMATION OF ADIABATIC SHEAR BANDS IN MILD STEEL UNDER DYNAMIC LOADING
L. S. Costin 1982 22 p refs Presented at the Joint Conf. on Expt. Mech., Honolulu, Hawaii, 22 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-010077; SAND-81-1708C; CONF-820516-1) Avail: NTIS HC A02/MF A01

The conditions of strain and temperature under which adiabatic shear bands form were examined using a torsional Kolsky (split-Hopkinson) bar apparatus. Thin walled tubular specimens of 1018 cold rolled steel were tested at an approximately constant strain rate in one of two strain rate regimes. In addition, the initial test temperature was varied from 173 K to 300 K. The total specimen strain was varied from test to test in order to determine the strain at which localized deformation begins at a given strain rate and temperature. Using a series of fine lines scribed along the inner surface of the tube parallel to its axis, the strain distribution along the gage length of the specimen was determined by post test examination. In this way it was determined whether the deformation was homogeneous or localized into a shear band. DOE

N83-21135# Oak Ridge National Lab., Tenn.
REVIEW OF TIME-DEPENDENT FATIGUE BEHAVIOR AND LIFE PREDICTION FOR 2 1/4 Cr-1 Mo STEEL
M. K. Booker and S. Majumdar 1982 89 p refs Presented at DOE/PNC Specialists' Meeting on Structural Mater. Data, Tokyo, Japan, 25 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010191; CONF-820121-2) Avail: NTIS HC A05/MF A01

Available data on creep-fatigue life and fracture behavior of 2 1/4 Cr-1 Mo steel are reviewed. Whereas creep-fatigue interaction is important for Type 304 stainless steel, oxidation effects appear to dominate the time-dependent fatigue behavior of 2 1/4 Cr-1 Mo steel. Four of the currently available predictive methods - the Linear Damage Rule Frequency Separation Equation, Strain Range Partitioning Equation, and Damage Rate Equation - are evaluated for their predictive capability. Variations in the parameters for the various predictive methods with temperature, heat of material, heat treatment, and environment are investigated. Relative trends in the lives predicted by the various methods as functions of test duration, waveshape, etc., are discussed. The predictive methods will need modification in order to account for oxidation and aging effects in the 2 1/4 Cr-1 Mo steel. Future tests that will emphasize the difference between the various predictive methods are proposed. DOE

N83-21136# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
LOCALIZED CORROSION IN MATERIALS FOR GEOTHERMAL POWER Final Report
A. R. Troiano and R. F. Hehemann Apr. 1982 145 p refs
(Contract DE-AC02-76ET-28317)
(DE82-015608; DOE/ET-28317/T2) Avail: NTIS HC A07/MF A01

The influence of 16 different geothermally related environments on a number of potentially useful steels was examined for both general and localized corrosion and at ambient and 150 C. Variation in chloride concentration of 1 to 20% generally demonstrated only minor aggressiveness in acidified solutions. In general, the presence of H2S raised the corrosion rate. However, very low concentrations (10 ppM) indicated higher rates than in saturated brines. This is rationalized on the basis of the inability to develop a semiprotective film at the low H2S concentration. The corrosion rate for the Cr-Mo steel was unexpectedly high at ambient, but improved substantially at 150 C. The Ni-Cu-Nb steel consistently demon-

strated excellent resistance in all environments, except the 10 ppM H2S at ambient. At 150 C there were no exceptions to its superior performance. Maximum pit depth studies, analyzed statistically, indicated that the Ni-Cu-Nb alloy was the most resistant to localized attack. DOE

N83-21137# California Univ., Livermore. Lawrence Livermore Lab.
THE EFFECT OF INHIBITORS ON THE CORROSION OF MOLYBDENUM IN WATER
J. J. Truhan, S. C. Aceves, and R. D. McCright 20 Aug. 1982 22 p refs
(Contract W-7405-eng-48)
(DE83-004405; UCRL-53317) Avail: NTIS HC A02/MF A01

The corrosion of Mo in water, which contains small additions of metal ions, was studied using electrochemical polarization. The effectiveness of various inhibitors was determined by comparing corrosion rates calculated by linear polarization and Tafel extrapolation techniques. These corrosion rates agreed well with those determined by weight loss measurements. Most of the inhibitors slowed the corrosion rate by about two orders of magnitude. DOE

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N83-21138 National Physical Lab., Teddington (England). Engineering Applications of Polymers Dept.
A FRAMEWORK FOR SPECIFYING THE FATIGUE PERFORMANCE OF GLASS FIBRE REINFORCED PLASTICS
G. D. Sims and D. G. Gladman Dec. 1982 27 p refs Presented at 13th Brit. Plastics Federation Congr. on Reinforced Plastics, Brighton, England 1982
(NPL-DMA(A)-59; ISSN-0143-7313) Copyright. Avail: Issuing Activity

A procedure was established for a low variability glass fiber fabric/epoxy laminate that allows S-N data obtained under different test conditions to be normalized with respect to the ultimate strength, measured for identical specimens and at a loading rate equivalent to the fatigue loading rate, to yield a single S-N curve. This procedure was successfully employed for a 40% change in properties over 5 decades of test frequency and for a 400% variation with temperature in the range 120 K to 420 K. Other parameters successfully incorporated into the normalization scheme have related to the effect of machined notches and holes, a prior high stress loading cycle and different water treatments. S.L.

N83-21139# Technische Hochschule, Aachen (West Germany). Lehrstuhl fuer Kunststoff verarbeitung.
USE OF EXPENDERS IN THERMOPLASTICS Final Report, Jun. 1981
Hans Ruehmann, Peter Geisbuesch, and Rainer Ecker Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 186 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(Contract DFVLR-01-VN-269-ZA/NT/NTS-2036)
(BMFT-FB-T-82-166; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

Criteria for the choice of extenders for thermoplastics are presented. These criteria essentially aim at the rentability. The mechanical properties to the filled thermoplastics were investigated in short and long term tensile tests, impact tests and torsion pendulum tests. The results of the tests of filled materials are compared with tests of the raw materials. An increase of the modulus of elasticity and a decrease of the impact strength is shown. E.A.K.

N83-21140# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
METHOD OF FORETELLING THE LIFETIME OF GLASS FIBER BUNDLED MATERIALS Final Report [VERFAHREN ZUR LEBENSDAUERVORHERSAGE FUER FASERVERBUNDWERKSTOFFE]
Johann Josef Gerharz and Dieter Schuetz Bonn Bundesministerium der Verteidigung 1982 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVG-FBWT-82-4; LBF-3975) Avail: NTIS HC A04/MF A01; DOKZENTBW, Bonn DM 30

For the design of fatigue critical structural parts, methods must be available by which the life of primary fatigue loaded elements can be analyzed. The life prediction methods especially developed for composite structures are mentioned and compared to each other. Life predictions using the model of 'residual-strength degradation' are compared with test results. The predictions are unconservative but closer to reality than the results from Miner's Rule. Applying the residual strength degradation concept the static strength, residual strength, and life to fracture data were connected by residual strength curves of equal probability of survival. Corresponding data of unnotched and jointed composite (graphite/epoxy) specimens were plotted this way. Author

N83-21141# Centre Technique des Industries Mecaniques, Nantes (France).
OUTLOOK FOR PLASTIC MATERIALS, ELASTOMERES PAINTS. REPORTS OF VISITS [PROSPECTIVE MATIERES PLASTIQUES - ELASTOMERS - PEINTURES (RAPPORT DE VISITES). PREMIERE PARTIE: MATIERES PLASTIQUES]
M. Bord Jul. 1981 244 p refs Partly in FRENCH and ENGLISH
(CETIM-12-B-194) Avail: NTIS HC A11/MF A01

Torlon is a poly(amide-imide) resin, developed especially for applications previously thought too severe for general polymers. Torlon molding resins provide exceptional strength and thermal resistance. They can be fabricated into high performance components capable of maintaining their structural integrity in continuous use in temperature environments of up to 260 C (500 F) and under extreme load bearing conditions. Using conventional high volume processing techniques, Torlon can be injection molded into complex, precision parts, or extruded and machined to extremely close tolerances all at a comparatively low cost. S.L.

N83-21142*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF HIGH TEMPERATURE STRUCTURAL ADHESIVES FOR EXTENDED SERVICE Semiannual Progress Report, 2 May - 2 Nov. 1981
S. G. Hill Nov. 1981 78 p refs
(Contract NAS1-15605)
(NASA-CR-170129; NAS 1.26:170129; SAPR-6) Avail: NTIS HC A05/MF A01 CSCL 11A

Eight different Ti-6Al-4V surface treatments were investigated for each of 10 candidate resins. Primers (two for each resin) were studied for appropriate cure and thickness and initial evaluation of bond joints began using various combinations of the adhesive resins and surface treatments. Surface failure areas of bonded titanium coupons were analyzed by electron microscopy and surface chemical analysis techniques. Results of surface characterization and failure analysis are described for lap shear bond joints occurring with adhesive systems consisting of: (1) LARC-13 adhesive, Pasa jell surface treatment; (2) LARC-13 adhesive, 10 volt CAA treatment; (3) PPQ adhesive, 10 volt CAA treatment; and (4) PPQ adhesive, 5 volt CAA treatment. The failure analysis concentrated on the 10,000 hr 505K (450 F) exposed specimens which exhibited adhesive failure. Environmental exposure data being generated on the PPQ-10 volt CAA and the LARC-TPI-10 volt CAA adhesive systems is included. A.R.H.

N83-21143*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POLYPHENYLENE ETHERS WITH IMIDE LINKING GROUPS Patent Application
Terry L. St.Clair and Harold D. Burks, inventors (to NASA) Filed

25 Feb. 1983 12 p
(NASA-Case-LAR-12980-1; US-Patent-Appl-SN-469866) Avail: NTIS HC A02/MF A01 CSCL 07C

Novel polyphenylene ethers with imide linking units are disclosed. These polymers incorporate the solvent and thermal resistance of polyimides and the processability of polyphenylene ethers. Improved physical properties over those of the prior art are obtained by incorporating metal linked ethers and/or polyphenylene oxides into the polymer backbone. A novel process for making polymers of this type is also disclosed. The process is unique in that the expected need of high process temperature and/or special atmospheres are eliminated. NASA

N83-21144*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF HIGH TEMPERATURE STRUCTURAL ADHESIVES FOR EXTENDED SERVICE Semiannual Progress Report, 2 Nov. 1980 - 2 May 1981
S. G. Hill, P. D. Peters, and C. L. Hendricks May 1981 100 p refs
(Contract NAS1-15605)
(NASA-CR-169882; NAS 1.26:169882; SAPR-5) Avail: NTIS HC A06/MF A01 CSCL 11A

The long term thermal aging data initiated in Phase 1 is reported. All candidate adhesive systems have exhibited significant degradation in bond properties after 505K (450 F) 10,000 hour exposure. Failures appear to be adhesive in the oxide layer. Phase 2 chemical characterization, cure cycle studies, baseline data, preliminary specifications, and environmental exposure data generated on polyphenyquinoxaline is presented. Similar but limited data on LARC-13 and NR056X adhesives is reported. Author

N83-21145# Catholic Univ. of America, Washington, D.C.
METALLIC HALIDE OPTICAL GLASSES: SYNTHESIS AND CHARACTERIZATION OF IR TRANSMITTING FLUORIDE GLASSES Final Technical Report, 23 Jan. 1981 - 30 Sep. 1982
C. T. Moynihan, K.-H. Chung, D. L. Gavin, A. J. Bruce, E. O. Gbogi, and M. Boulos Griffiss AFB, N.Y. RADC Oct. 1982 106 p refs
(Contract F19628-81-K-0010; AF Proj. 4600)
(AD-A122359; RADC-TR-82-264) Avail: NTIS HC A06/MF A01 CSCL 11/2

In this thesis, heavy metal fluoride glasses based on ZrF4, HfF4 and BaF2/ThF4 have been studied. The ZrF4- and HfF4-based glasses exhibit considerable promise as high transparency materials from the UV to the IR (0.2 - 7 micro m) and the BaF2/ThF4-based glasses exhibit transparency over even a larger region (0.2-9 micro m). At present there are several problems associated with the usage of these glasses in high technology systems, and these have been the main motive for the present study. One major problem is that the materials are relatively poor glass formers and have a strong tendency to crystallize on cooling. Another is that absorption bands at 2.9 micro m and 7 or 9 micro m, due respectively to -OH and metal oxyfluoride impurities, can cause significant transmission losses in the mid-IR radiation, if they can not be eliminated or at least substantially reduced. These transmission characteristics are most important with regard to the potential telecommunication system applications of these glasses. Concerning these problems, it was apparent that they were essentially related to the quality of glasses which could be produced (with respect to their homogeneity and impurity levels). GRA

N83-21146# Rutgers - The State Univ., Piscataway, N. J. High Pressure Materials Research Lab.
THE DEPENDENCE OF DIELECTRIC RESPONSE OF AN ELASTOMER ON HYDROSTATIC PRESSURE Technical Interim Report
K. D. Pae and D. L. Questad 15 Nov. 1982 21 p refs
(Contract N00014-82-K-0608; NR Proj. 092-002x)
(AD-A122340; TR-1) Avail: NTIS HC A02/MF A01 CSCL 11/9

Dielectric methods have been employed to study the high pressure behavior of a polyurethane elastomer (Solithane 113) in the vicinity of its alpha-transition. The alpha-loss peak is shifted to higher temperatures and broadened somewhat with the application of hydrostatic pressure up to 6.4 kilobars. The slope of the T sub alpha versus P, or dT sub(alpha)/dP, obtained at low frequencies was found to be equal to dTg/dP obtained by volumetric method. Moreover, it attained a non-zero limiting value at high pressures for each frequency tested (3-30,000 Hz) and the limiting value itself increased with increasing frequency from 10.5 oc/kbar at 3Hz to 18 C/Kb at 30,000 Hz. The activation enthalpy was found to be nearly constant over the pressure range tested, but the activation volume decreased with increasing pressure. The relation (dT(sub alpha)/dP) = T(delta V*/delta H*) was shown to hold for the elastomer. GRA

N83-21147# Pennsylvania State Univ., University Park. Lab. for Materials Research.
STRUCTURE OF GLASSES CONTAINING TRANSITION-METAL IONS Progress Report, 1 Jan. - 31 Oct. 1982
William B. White 1 Nov. 1982 19 p refs
(Contract DE-AC02-76ER-02754)
(DE83-003061; DOE/ER-02754/8; COO-2754-8) Avail: NTIS HC A02/MF A01

Investigations of host glasses include the completion of an interpretation of the Raman spectra of soda-gallia-silica glasses and some new work on zinc-containing glasses. The question of the structural environment of transition metal ions in silicate glasses and whether these ions should be regarded as occupying sites (a crystal-like model) or whether they form complexes (a solution-like model) continues to occupy attention. A study of combat in alkali silicate glasses was completed and work is underway on chromium in borate glasses. The investigation of diffusion processes and the hydration of glass surfaces by sputter-induced-photon spectrometry was completed and the final portions are reported. DOE

N83-21148# Mound Lab., Miamisburg, Ohio.
STRENGTH TESTING OF HIGH-ALUMINA CERAMICS
Michael C. Rey 11 Oct. 1982 11 p refs
(Contract DE-AC04-76DP-00053)
(DE83-001697; MLM-3006) Avail: NTIS HC A02/MF A01

Mechanical strength testing was conducted on sintered specimens made from three different commercially available, high-alumina ceramic powders. Measurement of the elastic moduli used in the analysis of fracture stress was made by ultrasonic velocity measurements. Significant differences in fracture strength were found between the results of biaxial flexure testing and four-point bend testing. DOE

N83-21149# Pennsylvania State Univ., University Park. Ceramic Science and Engineering Program.
CERAMIC RESEARCH ON TRANSFORMATION SUPERPLASTICITY AND STOICHIOMETRY EFFECTS ON FRACTURE Final Report
Richard C. Bradt Dec. 1981 6 p
(Contract DE-AC02-76ER-03420)
(DE83-001133; DOE/ER-03420/9) Avail: NTIS HC A02/MF A01

The research focused on three technical areas, domain boundaries in ferroelectrics, superplasticity associated with phase transitions in ceramics, some of a nonstoichiometric nature and some exposed to Co-60 gamma irradiation. The domain boundary studies yielded direct measurements of the widths of 900 domain boundaries, the transformational superplasticity studies resulted in the only data to date dealing with strains resulting from superimposed external stresses on ceramics undergoing phase transitions. These results are now being applied to the spinel-olivine transformation relating to plate tectonics, even though the phase transitions that were studied in this project are thermally induced as opposed to pressure induced. Studies of Co-60 irradiation effects on CaF2 single crystals show irradiation toughening. DOE

N83-21150# Bendix Corp., Kansas City, Mo.
BOND PROPERTIES OF LIQUID ADHESIVE
G. W. Bohnert Oct. 1982 12 p
(Contract DE-AC04-76DP-00613)
(DE83-001743; BDX-613-2833) Avail: NTIS HC A02/MF A01

Studies were conducted on a liquid adhesive used to bond circuit laminates to rigid plastic components. Areas investigated include: adhesive formulation, factors influencing bond strength, laminate cleaning, and automated adhesive application. DOE

N83-21151# Sandia Labs., Albuquerque, N. Mex. Development Labs. Div.
GLASS FORMULATION AND MELTING AT SANDIA NATIONAL LABORATORIES
Donn L. Stewart Feb. 1982 25 p refs
(Contract DE-AC02-76DP-00789)
(DE82-012066; SAND-81-1940) Avail: NTIS HC A02/MF A01

The physcial aspects of making high quality glass and glass ceramic are discussed. The study includes a description of necessary equipment, the batching of raw materials, melting, stirring, fining, pouring, casting, annealing, and glass characterization. DOE

N83-21152# Sandia Labs., Albuquerque, N. Mex.
DYNAMIC SHEAR BEHAVIOR OF ALUMINA-FILLED EPOXY
Laurence S. Costin Mar. 1982 22 p refs
(Contract DE-AC04-76DP-00789)
(DE82-013397; SAND-82-0344) Avail: NTIS HC A02/MF A01

Thin-walled tubular specimens of alumina-filled epoxy were loaded in torsion at a strain rate of approximately 1,000/s using a stored-torque Kolsky bar. In addition to measuring the time resolved shear stress and shear strain in the specimen, the axial stress generated by the dilation of the material during shear deformation was also obtained as a function of time. Tests were conducted at room temperature and at -60C. At room temperature, a moderate amount of plastic deformation occurred before failure. Material dilation was associated with the plastic flow. At -60C, there was a marked increase in failure stress over the failure stress at room temperature. However, little or no plastic deformation or dilation occurred before failure. DOE

N83-21153# National Bureau of Standards, Washington, D.C. Center for Materials Science.
HIGH TEMPERATURE APPLICATIONS OF STRUCTURAL CERAMICS
E. R. Fuller, R. J. Fields, T. J. Chuang, R. Krause, A. Dragoo, and S. J. Schneider 1982 8 p
(Contract DE-AI05-80OR-20679)
(DE82-016606; DOE/OR-20679/T8) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Information is presented concerning the high temperature fracture of structural ceramics; crack growth mechanism maps; microstructure and phase alteration; and microstructure and fracture in reactive environments. DOE

N83-21154# Sandia Labs., Albuquerque, N. Mex.
EFFECTS OF GAPS IN ADHESIVES THAT BOND ELASTICALLY DEFORMED PANELS TO PARABOLIC, CYLINDRICAL SUBSTRUCTURES
R. K. Wilson and R. C. Reuter, Jr. Mar. 1982 35 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014720; SAND-82-0291) Avail: NTIS HC A03/MF A01

In previous studies of the mechanical behavior of line focusing solar collectors, the reflective surface panel was modeled as a thin, initially flat, elastic plate that underwent large displacements to attain the shape of a prescribed parabolic cylinder. Among the myriad possible collector designs, some possess longitudinally oriented, hollow ribs or corrugations in the substructure which interrupt the transverse continuity of the bond line between the deformed panel and the substructure. Thus, finite gaps in the adhesive are present which create regions where the panel surface becomes intermittenly supported. The presence of these gaps perturbs the otherwise smooth distribution of adhesive contact stresses and it is the analytical modeling of this behavior that is the subject of the present report. In particular, attention is devoted to gaps which overlap with the edge effect zone, a region near the rim or vertex of the deformed panel where, in the absence of uniform edge loads necessary to maintain a true parabolic shape, high stresses and associated deformations occur. DOE

N83-21155# Hanford Engineering Development Lab., Richland, Wash.
FABRICATION OF LITHIUM CERAMICS BY HOT PRESSING
C. N. Wilson Mar. 1982 31 p refs Presented at the 84th Ann. Meeting of the Am. Ceramic Soc., Cincinnati, 2-5 May 1982
(Contract DE-AC06-76FF-02170)
(DE82-016261; HEDL-SA-2594-FP; CONF-820547-12) Avail: NTIS HC A03/MF A01

Controlled density LiAlO2, Li2ZrO3, Li4SiO4 and Li2O pellets were fabricated by hot pressing for irradiation testing as candidate tritium breeding materials. Pellet specifications, characterization data, and procedures for hot pressing, pellet grinding and halide removal are discussed. DOE

N83-21156# Department of Energy, Bartlesville, Okla. Energy Technology Center.
WASTE LUBRICATING OIL: AN ANNOTATED REVIEW, 1982 REVISION
F. O. Cotton Oct. 1982 277 p refs Revised
(DE83-001439; DOE/BETC/IC-82/4-Rev) Avail: NTIS HC A13/MF A01

Because of renewed interest in waste oil, both in terms of energy conservation and as a threat to the environment, there appears to be a need for a systematic compilation of information on the subject. This is a revision of the 1979 manuscript (BETC/IC-79/4) reflecting publications of the last three years as well as incorporation of papers that were overlooked. The number of citations has jumped from 486 to 1203, with all previous citations also listed here. The bibliography is divided into broad subject areas. The introduction gives the history and development of the used oil reclamation industry. The general section includes the comprehensive papers that address several subjects and thus, give a capsulated overview of the used oil situation. Sources of information and statistical treatments of data tell how to obtain additional and future information and data relating to waste oil and could aid those persons interested in keeping their knowledge current. The other lubricating oils section covers many of the lubricants that have the potential for recycling. The other oils section is divided into four sub-sections to aid the reader to find the subject of interest. The section on related subjects includes those sideline areas that could apply to used oil reclamation. DOE

N83-21157# D'Appolonia (E.) Consulting Engineers, Inc., Albuquerque, N. Mex.
EVALUATION OF POLYMER CONCRETE FOR APPLICATION TO REPOSITORY SEALING
W. E. Coons, D. Meyer, and P. C. Kelsall Nov. 1982 56 p refs
(Contract DE-AC06-76RL-01830)
(DE83-004366; ONWI-410) Avail: NTIS HC A04/MF A01

While polymer concrete can mean any concrete which incorporates a polymeric compound in the final product, this report evaluates concretes in which polymers are the primary cementing phases. Such materials have been developed for use in cementing wells drilled for geothermal energy because they can be formulated for low permeability, high strength, and resistance to chemical attack under short-term hydrothermal conditions. These attributes previously led to identification of polymer concrete as a material for possible use during sealing of nuclear waste repositories. A review of the literature reveals that polymer concretes are generally stronger, more resistant, and less permeable than common portland concretes. However, the performance of specialized portland concrete formulations compares favorably with polymer concrete. The review indicates that long-term stability of polymer concrete is suspect and that optimum emplacement of the material in large volume excavations may be both difficult and hazardous. Further, the cost of materials for fabricating polymer concrete may exceed the cost of portland concretes by an order of magnitude or more. DOE

N83-21158# National Bureau of Standards, Washington, D.C. Center for Building Technology.
MATHEMATICAL MODELS FOR THE CORROSION PROTECTIVE PERFORMANCE OF ORGANIC COATINGS Final Technical Note
James M. Pommersheim (Bucknell Univ.), Paul G. Campbell, and Mary E. McKnight Sep. 1982 102 p refs
(PB83-115550; NBS-TN-1150) Avail: NTIS HC A06/MF A01 CSCL 11C

Mathematical models were developed for conceptual models describing the principal phenomena that occur in the corrosion performance of polymeric coatings. These include models for water and oxygen permeability through organic coatings, models for the growth of blisters beneath coatings, and preliminary models for the polarization occurring at the electrode surfaces. Results predicted by the models are discussed in terms of the improvement of the protective function of the membrane. GRA

N83-21159# Korean Atomic Energy Research Inst., Seoul. Radiation Processing Research Room.
RADIATION OF GRAFTING OF FLAME RETARDANTS ONTO POLYESTER/COTTON BLEND FABRIC BY AN ELECTRON BEAMS
J. Choi, J. K. Lee, Y. K. Kong, and H. S. Chang 1980 47 p refs Transl. into ENGLISH from unidentified Korean book, 1980 50 p
(PB83-114892; KAERI-396/RR-129/80) Avail: NTIS HC A03/MF A01 CSCL 11E

When the various flame retardants were grafted onto polyester/cotton (65/35) blend fabric at room temperature, the graft percent was increased with the increase of radiation dosages. The great percentage of flame retardants at low dose rate is higher than that of flame retardants at high dose rate. It is the suitable method for the high grafting efficiency that the samples were irradiated by mutual method and then were cured 120 exp O C for 10 minutes. In the case of fyral 76 mixture solution, the rate of grafting (%/sec) was proportional to the power 0.75 for dose intensity and in 2 bromoethyl acrylate/bis (2-chloroethyl) vinyl phosphonate (40/60) the rate of grafting was proportional to the power 0.96 for dose intensity. Author (GRA)

N83-21160# Agfa-Gevaert A.G., Munich (West Germany). Phototechnique.
DEVELOPMENT OF OPTICAL PLASTICS
Helmut Duerr, Carl Heynemann, and Hans Hespe (Baker A.G.) Nov. 1980 35 p refs Transl. into ENGLISH of the book "Entwicklung Optischer Kunstsoffe" West Germany, Nov. 1980 47 p
(PB83-107706; BMFT-FB-T-81-121) Avail: NTIS HC A03/MF A01 CSCL 11I

There are currently only four thermoplastics on the market which are suitable for the production of optical imaging systems. A large range of thermoplastics with differing optical qualities is required for the design of new plastic lenses. The aim of this project was the development of such materials. Commonly known general correlations between structure and refractive value, as well as pretesting of over 300 compounds formed the bases for a final selection of 3 product groups for optimization. The improvements made to these materials through experimental injection molding and by measuring further physical material ratings finally led to a thermoplastic with n 1.6, to 4 thermoplastics with optical data between those of PMMA and PS or PC, and also to a material which combines a low refractive value with relatively high optical dispersion, such as has never been observed in the case of thermoplastics before. With this, the selection of thermoplastic polymere available for optical applications have confirmed usability, further applications are being prepared. GRA

N83-21161# SRI International Corp., Menlo Park, Calif.
POLYMER DEGRADATION DURING COMBUSTION Annual Report
S. K. Brauman and I. J. Chen Sep. 1982 41 p refs Revised (Contract NB80-NADA-1003)
(PB83-110015; NBS-GCR-82-403-Rev) Avail: NTIS HC A03/MF A01 CSCL 11I

The steady state degradation and gasification of polystyrene was examined by a driven rod radiant pyrolysis technique. The impinging radiation flux (5.6 watts/sq cm) produced the same surface regression rate (0.06 cm/min) as was observed for the rods burning in air. The temperature profile in the regressing rod was measured by a fine thermocouple (0.13 mm junction) and the result used in conjunction with isothermal deg radiation kinetics to predict the rate of polystyrene gasification. The predicted rate is about 65% of the observed rate for the case of a nitrogen atmosphere. The degradation mechanism for polystyrene is substantially unchanged in going from isothermal pyrolysis to combustion conditions. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N83-21162 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
ENERGY OUTPT OF HIGH EXPLOSIVES. EXPERIMENTAL RESULTS OF ONE-INCH CYLINDER EXPANSION TEST
T. deJosselindeJong, J. D. Roest, and H. W. R. Sabel Jul. 1982 42 p refs In ENGLISH; DUTCH summary
(PML-1982-38; TDCK-77220) Copyright. Avail: Issuing Activity

This report describes the experimental set-up of the PML 1-inch Cylinder Expansion (Cylex) Test. The method to obtain expansion data from digesting the streak records is reported and results are provided of tests executed with five different types of high explosive. The results of experiments with two types of high explosive (Nitromethane and Composition B, grade A) are found to be in good agreement (within 2 percent) with the results obtained at the Lawrence Livermore National Laboratory (USA) and with values calculated according to a theoretical model. Author

N83-21163# Materials Research Labs., Melbourne (Australia).
PYROTECHNIC SWITCH
G. D. Holt 1982 15 p
(MRL-TN-467; AR-003-049) Avail: NTIS HC A02/MF A01

A pyrotechnic switch which is nonconducting before actuation and fully conducting after actuation has been developed. The switch utilizes the principle that a pyrotechnic composition containing oxides and a fuel has a very high electrical resistance prior to ignition. However, after ignition the oxide is converted to a low resistance metal slag makes contact between two points in a switch. Author

N83-21164# Materials Research Labs., Melbourne (Australia).
THE DEVELOPMENT OF PLASTIC THERMITE
R. J. Hancox 1983 18 p refs
(MRL-R-868; A8-003-056) Avail: NTIS HC A02/MF A01

A plastic thermite has been developed at MRL which can be readily ignited by an electrically actuated igniter or by safety blasting fuse such as plastic initiating cord (PIC). The plastic thermite is a powerful incendiary device, capable of igniting oil and a wide range of materials. Plastic thermite is made with a water repellant resin and can be stored under water. It can also be ignited when under oil or water. This material is nonexplosive and is completely safe to handle. Author

N83-21165# National Mechanical Engineering Research Inst., Pretoria (South Africa).
PROPANOL-PLUS AS EXTENDER TO DIESEL FUEL
I. S. Myburgh 1982 7 p refs
(CSIR-ME-445) Avail: NTIS HC A02/MF A01

A by-product of the SASOL fuel from coal process, propanol plus was found to be the most satisfactory diesel fuel extender of all the alcohols tested. Fuel requirements and properties discussed include: (1) initial boiling temperature; (2) heat of combustion; (3) viscosity; (4) flash point temperature; (5) autoignition quality;

and (6) miscibility with diesel. The consituents of propanol plus are listed by mass and results of engine tests are examined.
A.R.H.

N83-21166# National Mechanical Engineering Research Inst., Pretoria (South Africa).
A STUDY OF POSSIBLE DETRIMENTAL EFFECTS ON INTERNAL COMBUSTION ENGINES BY THE COMBUSTION OF GASOHOL BLENDS
I. S. Myburgh, G. Kerens, and E. vanBergen (Datsun-Nissan Co. (Pty) Ltd., Rosslyn, South Africa) May 1982 6 p Presented at the 5th Intern. Alcohol Fuel Technol. Symp., Auckland, New Zealand, May 1982
(CSIR-ME-446) Avail: NTIS HC A02/MF A01

Petrol/alcohol blends are marketed and supplied through the normal retail outlets as a fuel for motor vehicles. The alcohol, produced as a by-product from the SASOL process consists mainly of ethanol with the higher alcohols n-propanol, secondary butanol and iso-propanol. The long term effect of this alcohol on engine life when used in a blend with petrol was investigated. S.L.

N83-21167# European Space Agency, Paris (France).
CATALOGUE OF EUROPEAN PYROTECHNIC DEVICES FOR USE IN SPACE
J.-P. Bouloumie, comp. (CNES, Toulouse) and N. Cable, comp. (ESTEC, Noordwijk, Neth.) Oct. 1982 426 p In ENGLISH and FRENCH
(ESA-SP-1021; ISSN-0379-6566) Avail: NTIS HC A19/MF A01

Information on different pyrotechnically activated devices is presented. Initiators, pressure cartridges, detonators, igniters, gas generators, actuators, valves, cutters, transfer lines, separation/destruct systems, electric functions, rocket motors, and location aid systems are discussed. Author

N83-21168# California Univ., Irvine. Lab. for Sanitary Engineering and Environmental Health.
ENVIRONMENTAL QUALITY RESEARCH: FATE OF TOXIC JET FUEL COMPONENTS IN AQUATIC SYSTEMS Annual Report, 1 Jun. 1981 - 31 Aug. 1982
Robert C. Cooper, Leon Hunter, P. C. Ulrichs, and R. Danielson Wright-Patterson AFB, Ohio AFAMRL Oct. 1982 101 p refs
(Contract F33615-80-C-0512; AF Proj. 6302)
(AD-A122548; AFAMRL-TR-82-64) Avail: NTIS HC A06/MF A01 CSCL 06/20

This report describes an investigation into the nature of the toxic components in the jet fuel JP-4. Toxicity evaluation was based on the inhibitory effect of the fuel water soluble extract (WSF) on the hatchability of Artemia salina eggs. JP-4 samples from different sources were shown to differ substantially both in hydrocarbon composition and toxicity. Toxicity tests with individual model hydrocarbons and mixtures indicated that: (1) contrary to widely held views, alkane hydrocarbons were substantially (20-50 times) more toxic than aromatics; (2) the major WSF components benzene, toluene, and xylenes (70-90% of total) accounted for less than 30% of WSF toxicity; and (3) the estimated toxicity of the remaining WSF hydrocarbons was high enough (approximately 2 ppm) to account for the rest of the WSF toxicity. It was concluded that all the JP-4 hydrocarbons were toxic, their contribution being dependent on the proportion present in the water soluble fraction, and that JP-4 toxicity was the sum of the toxicities of its component hydrocarbons. Least squares plots have been developed that allow prediction of maximum JP-4 WSF toxicities from: (1) benzene/toluene levels in the neat fuel and; (2) total hydrocarbon levels in the WSF. Author (GRA)

N83-21169# Boeing Military Airplane Development, Seattle, Wash. Operational Analysis Group.
FUEL/ENGINE/AIRFRAME TRADE-OFF STUDY: OPERATIONAL EFFECTS OF INCREASED FREEZE POINT FUELS Final Report, 2 Mar. 1981 - 30 Apr. 1982
P. M. McConnell, L. A. Massmann, G. N. Peterson, and F. P. Tolle Wright-Patterson AFB, Ohio AFWAL Aug. 1982 180 p refs
(Contract F33615-78-C-2001; AF Proj. 3048)
(AD-A121688; AFWAL-TR-82-2067) Avail: NTIS HC A09/MF A01 CSCL 21/4

This study of extreme low temperature C-141, KC-135, and B-52 operational missions indicates that the -58 C freeze point specification for JP-4 fuel is ultra conservative. The study suggests that the freeze point could be increased by at least 12 C with no effect on in-flight performance and that there is a good possibility that commercial, Jet A fuel (-40 C freeze point) would be acceptable for these aircraft. A method of identifying realistic extreme low temperature, in-flight exposure and airplane fuel system response was developed. The ground environmental extremes were not studied and could impact the conclusions. GRA

N83-21170# Ballistic Research Labs., Aberdeen Proving Ground, Md.
RELATIONSHIP OF COMBUSTION CHARACTERISTICS AND PHYSICAL PROPERTIES OF BLACK POWDER Memorandum Report, Sep. 1980 - Sep. 1981
Kevin J. White and Ronald A. Sasse Nov. 1982 38 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A122264; AD-F300135; ARBRL-MR-03219) Avail: NTIS HC A03/MF A01 CSCL 19/1

Examination of closed chamber results and flamespread measurements in primer tubes indicates that grain break-up or deconsolidation may take place under conditions of vigorous ignition. It is suggested that mechanical properties may affect the ballistic performance of black powder. Evidence is also presented to show that the manufacturing process of black powder can effect the mechanical properties and, hence, the ballistic performance. Windowed combustor measurements yield a low-pressure exponent (0.164) for the burn rate of black powder at pressures greater than 0.3 MPa. At pressures up to 13 MPa there is no evidence of combustion-induced deconsolidation. GRA

N83-21171# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
FLEET EXPERIENCE USING A METHANOL/UNLEADED GASOLINE BLEND
David S. Simpson Nov. 1982 20 p refs
(Contract DE-AC09-76SR-00001)
(DE83-003834; DP-1648) Avail: NTIS HC A02/MF A01

The Savannah River Plant is successfully operating automotive and nonautomotive gasoline powered equipment on a 3% methanol/97% unleaded gasoline blend. A test fleet of 50 vehicles began using the methanol/gasoline blend in March 1982, and following positive results, the remainder of the plant fleet began recording mileage on the blend fuel in June 1982. The plant fleet contains approximately 750 automotive and 250 nonautomotive units; and in six months, approximately 2.2 million miles have been driven using the blend fuel. DOE

N83-21172# Southwest Research Inst., San Antonio, Tex. Energy Systems Research Div.
REFINING STUDIES AND ENGINE TESTING OF ALTERNATIVE HIGHWAY-TRANSPORTATION FUELS: IDENTIFICATION AND EVALUATION OF OPTIMIZED ALTERNATIVE FUELS Final Report
Norman R. Sefer, John A. Russell, Thomas W. Ryan, III, and Timothy J. Callahan Sep. 1982 129 p refs
(Contract DE-AC01-79CS-50017)
(DE83-003332; DOE/CS-50017/3) Avail: NTIS HC A07/MF A01

The study of alternative highway transportation fuels was conducted in three major phases. Linear programming models were used in the first phase to show how shale oil and coal liquids would be used. Models for Rocky Mountain, Mid-Continent, and Great Lakes composite refineries were developed to make forecast quantities of products in 1995. Computer cases investigated maximum diesel fuel and broadcut fuel in each region. Use of methanol, ethanol, and MTBE in gasoline was explored in one region. Results included product quality and compositions. Fuel formulation and blending were conducted in the second phase. Synthetic products from shale and coal were used in a series of diesel and broadcut fuels. A group of synthetic gasolines was

also prepared, some of which were simulated coal derived products. Products were shared with other laboratories for evaluation. Engine testing was the final phase of the project. All fuels were subjected to screening tests in single cylinder CLR engines of either spark or compression ignition type. Selected fuels were given durability tests in the same engine and chassis dynamometer tests in vehicles. DOE

N83-21173# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FOR CORN: 100-MILLION GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA
31 May 1982 465 p 6 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000772; DOE/ID-12274/T1-Vol-6) Avail: NTIS HC A20/MF A01

Appendices are included for specifications and design criteria, equipment list, motor list, companies contacted for marketing, and schedules for a feasibility study of an ethanol from corn production facility. DOE

N83-21174# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY INPUTS AND OUTPUTS OF FUEL-ALCOHOL PRODUCTION, SUMMARY VOLUME Final Report
Apr. 1982 73 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DE-AC01-80CS-50005)
(DE83-000367; DOE/CS-50005/T1-Summ) Avail: NTIS HC A04/MF A01

A summary and comparison are presented of the energy inputs and outputs for producing 100 million Btu of alcohol from representative versions of the three alternatives studied: ethanol from grain, methanol from cellulose, and methanol from coal. Methanol from cellulose appears to be the most attractive of the alternatives from a net energy standpoint. DOE

N83-21175# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY INPUTS AND OUTPUTS OF FUEL-ALCOHOL PRODUCTION. APPENDICES A AND B, ETHANOL FROM GRAIN
Apr. 1982 71 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DE-AC01-80CS-50005)
(DE83-000368; DOE/CS-50005/T1-App-A-B) Avail: NTIS HC A04/MF A01

Estimates are developed of present energy requirements for producing five grains (corn, grain, sorghum, winter wheat, barley and oats) and of energy requirements for increasing production of two of these grains (corn and grain sorghum). Brief discussions are also included of the overall potential for increasing crop land and for increasing grain production for conversion to ethanol. The energy and materials consumption of both wet and dry milling technologies are considered for the conversion of grain to ethanol. DOE

N83-21176# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
REFORMED METHANOL
Joseph G. Finegold, J. Thomas McKinnon, and Michael E. Karpuk
1982 14 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-002096; SERI/TP-235-1774) Avail: NTIS HC A02/MF A01

This paper describes the design and testing of an automotive fuel system that provides hydrogen-rich gases to an internal combustion engine by catalytically cracking, or dissociating, methanol on board the vehicle. The vaporization and dissociation of methanol absorb heat from the engine exhaust and increase the lower heating value of the fuel by approximately 22%. In addition, raising the compression ratio and burning with excess air increase the engine thermal efficiency. Engine dynamometer test results with dissociated methanol demonstrated improvements in brake thermal efficiency compared to gasoline of up to 50% depending on engine speed and torque. Lower speeds and torques produce the largest improvements. This paper presents maps of exhaust temperature and exhaust heat content. The exhaust temperature is almost always high enough for dissociation to occur, but, at lower power outputs, there is only enough exhaust energy for partial dissociation of the methanol. This concept also applies to combustion turbines. Steam reformed methanol allows higher efficiency and more power compared to petroleum fuels, liquid methanol, or dissociated methanol. The hydrogen-rich gases do not require cooling before entering the turbine. DOE

N83-21177# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY INPUTS AND OUTPUTS OF FUEL-ALCOHOL PRODUCTION, APPENDICES G AND H. METHANOL FROM COAL
Apr. 1982 66 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DE-AC01-80CS-50005)
(DE83-000370; DOE/CS-50005/T1-App-G-H) Avail: NTIS HC A04/MF A01

The energy consumed in mining coal for eventual conversion to methanol is analyzed. Energy consumption estimates are developed for both underground and surface mining methods. The estimated energy requirements to convert mined coal to fuel grade methanol are described. DOE

N83-21178# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
ENERGY INPUTS AND OUTPUTS OF FUEL-ALCOHOL PRODUCTION, APPENDICES C THROUGH F. METHANOL FROM CELLULOSE
Apr. 1982 112 p refs Prepared in cooperation with Battelle Columbus Labs., Ohio
(Contract DE-AC01-80CS-50005)
(DE83-000369; DOE/CS-50005/T1-App-C-F) Avail: NTIS HC A06/MF A01

Estimates are developed of the amount of fuel that would be consumed in the collection of forest residues, by harvest system type and by logging operation. Separate estimates are developed for both the Eastern and Western regions of the United States. The availability of both forest residues and mill residues are discussed. The energy inputs for the growing, harvesting, and processing of wood feedstocks for conversion into alcohol fuels are identified on the basis of a conceptualized operation of a silvicultural biomass farm. Estimates are developed of energy consumption resulting from the collection and of the overall availability of crop residues. Estimates are developed of the energy inputs and outputs for the production of methanol from cellulosic materials. DOE

N83-21179# Michigan Univ., Ann Arbor.
REFUSE-DERIVED FUEL FACILITY FOR THE UNIVERSITY OF MICHIGAN
Apr. 1982 105 p refs
(Contract DE-FG01-80RA-50344)
(DE82-013194; DOE/RA-50344/1) Avail: NTIS HC A06/MF A01

The purpose of the study is to determine the feasibility of processing municipal solid waste (MSW), supplied by the City of Ann Arbor, Michigan, into refuse-derived fuel (RDF) to be sold to the University of Michigan for use in a cogeneration facility on its North Campus. The report contains an analysis of potential sites, including transportation factors, for a refuse sorting and processing plant at the City of Ann Arbor landfill area and a cogeneration central energy plant at the University of Michigan's North Campus; a summary of the Ann Arbor Waste Stream Analysis; an analysis of municipal waste processing in the proposed Ann Arbor landfill area plant; an in-depth study of projected energy loads at the North Campus; North Campus utility concepts; a description of the functional design for the proposed North Campus central energy plant; cost analyses for 1985, 1990, 1995, and 2000; an assessment of environmental considerations; and recommendations for future action. DOE

N83-21180# Sandia Labs., Albuquerque, N. Mex.
DETONATOR DEVELOPMENT Status Report, period ending 30 Oct. 1981
A. K. Jacobson Jan. 1982 28 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014532; SAND-81-2527) Avail: NTIS HC A03/MF A01

The MC3644 detonator is being developed as a replacement for the MC3132 flying plate detonator in the parachute deployment system of the B83 weapon. The MC3644 is a CP, deflagration-to-detonation transition device. Two models are being developed: an interim design using the MC3423 ignitor and a new production version with a one-piece ignitor/header assembly. Features of both designs are described. Results of development tests involving the interim design are presented. No-fire sensitivity test and proof-test results with the WR version are also included. The development program is on schedule. DOE

N83-21181# California Univ., Livermore. Lawrence Livermore Lab.
DETONATION OF POROUS, HIGH-HMX, NITROGLYCERINE CONTAINING PROPELLANT BY LOW-LEVEL SHOCK
L. G. Green, E. S. Chambers, E. L. Lee, and B. Brown (Hercules, Inc., Magna, Utah) 1982 6 p refs Presented at the Propulsion Systems Hazards Meeting, China Lake, Calif., 19-21 Apr. 1982
(Contract W-7405-eng-48)
(DE82-012809; UCRL-87451; CONF-820431-2) Avail: NTIS HC A02/MF A01

The sympathetic detonation throw distances to impact damaged propellant were measured. Reflected pressures at the threshold distances are about the same as pressures generated in piston compaction experiments on porous propellant at threshold piston velocities. Run distance to detonation experiments done on porous propellant using a steel impactor represent a final state from which run up to detonation occurs in both piston compaction experiments and in classical DDT experiments, which are seen as combustion driven mechanical compactions. DOE

N83-21182# Sandia Labs., Albuquerque, N. Mex.
THE SIMULATION OF POWDER-DECOUPLING PHENOMENA IN ELECTRO-EXPLOSIVE DEVICES BY THERMOMECHANICAL ANALYSIS (TMA)
T. M. Massis, P. K. Morenus, and B. R. Steele 1982 17 p refs Presented at the Joint Symp. on Compatability of Plastics and Other Mater. with Explosives, Phoenix, Ariz., 30 May 1982
(Contract DE-AC04-76DP-00789)
(DE82-010357; SAND-82-0064C; CONF-820518-1) Avail: NTIS HC A02/MF A01

A thermomechanical analysis (TMA) technique was developed to simulate the decoupling or movement of a pyrotechnic away from the bridgewire in a loaded actuator configuration. By applying a force on the TMA probe assembly resting against the pressed pyrotechnic in an epoxy charge holder, the pyrotechnic in an epoxy charge holder, the pyrotechnic, TiH-65/KClO4, was observed to move or slip in relation to the stationary charge holder material when thermally cycled from -50 C to +50 C. A mismatch of greater than two to one was observed in the expansion coefficients of the TiH-65/KClO4 and charge holder materials. The TMA technique simulated the mechanical shock forces and thermal cycle applied to the actuator during component environmental testing. DOE

N83-21183# Mueller Associates, Inc., Baltimore, Md.
SAFE HANDLING AND TESTING OF ALTERNATIVE FUELS
Jan. 1982 31 p refs
(Contract DE-AC05-79CS-56051)
(DE82-009176; DOE/CS-56051/6) Avail: NTIS HC A03/MF A01

Safety hazards involved in the handling and use of conventional and alternative fuels are presented. Recommendations for fire fighting of alcohol and alcohol blend fuels are described. Physical property and toxological data on conventional and alternative fuels are included. Report is intended for those individuals inexperienced in the handling and use of fuels and as a general reference on fuel safety. DOE

N83-21184# Los Alamos Scientific Lab., N. Mex.
ALL-SECONDARY EXPLOSIVE FLYING-PLATE DETONATORS
Robert H. Dinegar Oct. 1982 13 p
(Contract W-7405-eng-36)
(DE83-002919; LA-9443-MS) Avail: NTIS HC A02/MF A01

A hot wire can ignite PETN and HMX explosives. When deflagrated under confinement, they generate gas pressures sufficient to rupture thin aluminum disks. These flying plates reach a velocity high enough to initiate secondary explosives upon impact. The mass and size of the PETN or HMX donor charge can vary considerably, and the igniter will function if the explosive is highly compacted. Short lengths of PETN, HMX, and HNS can be used as acceptor explosives and be initiated to detonation by a flying plate over a wide range of pressing densities. Flyer barrels between 3.5 and 7.0 mm long and with diameters of 2.5 and 3.8 mm have proved satisfactory. Additional tests strongly indicate that an acceptor charge diameter that is smaller than that of the flying plate is an important condition. DOE

N83-21185# Aerospace Corp., El Segundo, Calif. Energy Conservation Directorate.
ASSESSMENT OF METHANE-RELATED FUELS FOR AUTOMOTIVE FLEET VEHICLES. VOLUME 1: EXECUTIVE SUMMARY
Feb. 1982 51 p 3 Vol.
(Contract DE-AC02-80CS-0179)
(DE83-000280; DOE/CE-50179/1-Vol-1) Avail: NTIS HC A04/MF A01

The use of methane-related fuels, derived from a variety of sources, in highway vehicles is assessed. The term methane, includes and is interchangeable with natural gas (NG) as well as synthetic (or substitute) natural gas (SNG), provided methane is the predominant constituent. Methanol is included because it can be produced from NG or the same resources as SNG, and because it is a liquid fuel at normal ambient conditions. Technological, operational, efficiency, petroleum displacement, supply, safety and economic issues are analyzed. The assessment is intended to satisfy Section 7(a) of the Methane Transportation Research, Development, and Demonstration Act of 1980 (PL 96-512), which focuses on expanded methane use in automotive fleet vehicles and farm equipment. DOE

N83-21186# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
THE EFFECT OF THERMAL AGING ON THE THERMAL STABILITY AND FRICTION SENSITIVITY OF EXPLOSIVES
Patricia A. Foster and Elisha L. Demerson Dec. 1982 30 p refs
(Contract DE-AC04-76DP-00487)
(DE83-005031; MHSMP-81-41) Avail: NTIS HC A03/MF A01

Five explosives (LX-10, PBX 9501, PBX 9502, HMX/Kraton, and RX-03-DI), were aged in helium and air atmospheres at temperatures of ambient, 40, 50 and 70 C for 18 months. Thermal analysis (CRT, Henkin, DSC) showed little change in the explosives. Friction tests indicate that the PBX 9501 to be less sensitive after 70 C aging which is probably due to binder degradation. Atmospheric analysis of the containers with PBX 9501 shows the explosive undergoes degradation (probably binder) at the 70 C temperature. It appears that LX-10 may become more friction sensitive after aging. No conclusions could be reached regarding the effect of thermal aging on the friction sensitivities of the other explosives. DOE

N83-21187# National Science Foundation, Washington, D.C. Div. of Research Policy and Analysis.
WORKSHOP ON THE FEDERAL ROLE IN SYNFUELS DEVELOPMENT
1982 575 p Workshop held in Washington, D.C., 11-12 May 1981
(PB83-102236; NSF/PRA-82010; NSF-82-45) Avail: NTIS HC A24/MF A01 CSCL 21D

Answers are offered to the question: How large an investment in the synthetic fuels program is appropriate? Substantial learning and information benefits from a small synfuels program are identified and it is noted that a large synfuels program does not

make sense unless synfuels costs are very low and oil costs are very high. Political considerations and Federal funding constraints connected with the issues of the synfuels program are considered. The lack of any cooperative trust between industry and government is said to be a significant problem for the development of synthetic fuels. The economic problem of timing the synfuels program correctly is addressed. If there is too great a supply of synfuels too soon, synfuels will not be priced competitive. Conversely, if the supply is too little and too late, there will be a serious shortage. The lack of any technology-specific environmental requirements for the synfuels industry is noted and a joint review process is suggested to speed up the permit process.
Author (GRA)

N83-21188# General Accounting Office, Washington, D. C. Energy and Minerals Div.
STATUS OF THE GREAT PLAINS COAL GASIFICATION PROJECT, AUGUST 1982
14 Sep. 1982 39 p refs
(PB83-115139; GAO/EMD-82-117; B-207876) Avail: NTIS HC A03/MF A01 CSCL 21D

Construction of the Great Plains coal gasification plant is 4 to 6 weeks behind schedule, but no long term impacts are anticipated. Cumulative project costs are lower than originally estimated. Overall, the management system established to oversee project construction appears comprehensive. However, some weaknesses exist in the computerized information system, which produces most project data. The cost incurred by Great Plains are audited to determine that funds are being used only for eligible projects costs. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N83-21189 National Physical Lab., Teddington (England). Div. of Quantum Metrology.
[ACTIVITIES REPORT OF THE DIVISION OF QUANTUM METROLOGY] Annual Report, 1981
Oct. 1982 38 p refs
(NPL-QU-AR-81; ISSN-0309-3050) Copyright. Avail: Issuing Activity

The total radiation experiment in providing preliminary results of both the Stefan-Boltzmann constant and of thermodynamic temperature in the region 0-100 C was demonstrated. The temperatures obtained so far show considerable deviations from IPTS-68 in this important range and are broadly in agreement with results of recent gas thermometry. Redefinition of the practical temperature scale was made by measurements of the thermodynamic temperatures of the freezing points of silver and gold by photon-counting pyrometry. A mobile diode-laser system for long-path atmospheric monitoring was developed. Continuous monitoring for several hours is possible with these very stable lasers and concentrations of CO in air as low as 5 parts per billion can be detected. In the environmental field, a package of six instruments was successfully flown by balloon to measure stratospheric trace gases in a collaborative exercise. B.G.

N83-21190# British Library Lending Div., Boston Spa (England).
CUTTING THIN-WALLED TUBES WITH ROTARY SAWS
Yu. E. Kim and A. A. Ishchenko 13 Dec. 1982 5 p Transl. into ENGLISH from Iz. Vyssh. Ucheb. Zaved. Chern. Metall. (USSR), v. 11, 1981 p 69-71
(BLL-M-26835-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

It is found that a high quality cut can be obtained at feed rates up to 1.6 m/s by using clamping devices during the cutting of hot thin walled tubes with saw discs. The analytical function obtained enables the amount of deformation at any distance from the cutting plane to be determined, the rational cutting procedures for observing the diametric shape tolerances to be selected, or the amount of scrap from end cropping to be calculated. The possibility of increasing the feed rate and the greater tooth pitch of the disc during rotary cutting gives a better quality cut than tube cutting with carriage saws. S.L.

N83-21191# Institutsgemeinschaft Stuttgart e.V. (West Germany).
REDUCED ENERGY REQUIREMENT FOR AIR CONDITIONING BY USING AIR DIFFUSION WITH AIR FLOW FROM FLOOR TO CEILING Final Report, February 1981
Heinz Bach, Walter Dittes, Reinald Mangelsdorf, Ruediger Detzer (Kessler u. Luch GmbH), Eberhard Jungbaeck (Kessler u. Luch GmbH), Klaus Fitzner (Nickel (Heinrich) GmbH), Wolfgang Radtke (Schmidt Reuter Ingenieurges. mbH), and Freddi Soethout (Schmidt Reuter Ingenieurges. mbH) Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 324 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-023; ISSN-0340-7608) Avail: NTIS HC A14/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 48,90

When supplying air from the ceiling in an air-conditioned room, there is a mixing all over the room; when supplying from the floor or from desks there is mixing region only in the lower area. Above is warm air from which the return air is drawn. For air supply from below, the cooling load can be decreased. In combination with the possible enthalpy difference between room air supply air the decrease of the cooling load influences the necessary air rate. The interdependence of various air conditioning systems and various air temperatures is shown with a computer program. The theoretically gained influence of the supply air jets of the height of the mixing region and on the load rate were verified by the experiments. The annual energy consumption was computed for a building assuming various air conditioning systems and typical operation data. How air distribution from floor to ceiling can be installed and operated is discussed. A.R.H.

N83-21192# Oxford Univ. (England). Dept. of Engineering Science.
DIRECT SOLUTION OF PLASTICITY PROBLEMS IN SOILS BY THE METHOD OF CHARACTERISTICS
G. T. Houlsby and C. P. Wroth 1982 25 p refs Presented at 4th Intern. Conf. on Numerical Meth. in Geomech., Edmonton, Can., 1982 Sponsored by UC Dept. of the Environment and Building Research Estab.
(OUEL-1395/82) Avail: NTIS HC A02/MF A01

The method of characteristics is well established as a direct method of solving for the stresses in plastically deforming soils under conditions of plane strain. The application of similar methods to problems of axial symmetry, and to soils with nonhomogeneous properties is described and some illustrative examples given. The method of characteristics may also be used for the solution of the plastic displacement equations, although the exact form which these equations should take is still a matter of controversy. Illustrations are given of displacement calculations using the simplifying assumptions either of an associated flow rule (which is unrealistic for a frictional material) or using a fixed rotation term (which, although it has no physical justification, leads to realistic displacement fields). Author

N83-21193# Messerschmidt-Boelkow G.m.b.H., Ottobrunn (West Germany). Space Div.
MACS: CHARACTERISTICS AND DESIGN RULES, HANDBOOK
K. Fetzer, A. Grundmann, H. Bittner, H. Hufnagel, B. Moeckl, J. Starke, G. Stich, F. Krutzen, and H. Lamberts Paris ESA 1 Sep. 1982 155 p
(Contract ESTEC-4581/81/NL-AK(SC))
(MBB-URV-130(82); ESA-CR(P)-1686) Avail: NTIS HC A08/MF A01

System level characteristics, unit level characteristics, attitude control electronics, a monitoring and reconfiguration unit, interfaces, power distribution concept, S/W characteristics, application

software, handler S/W, and standard equipment characteristics are discussed. Author

N83-21194# Krupp (Fried.) G.m.b.H., Wilhelmshaven (West Germany).
DEVELOPMENT OF SAFETY MAGNETS FOR LOAD HOISTING Final Report, Dec. 1979
Wilhelm Schwarz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-81-021; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,60

The development of permanently excited magnets, of which the magnetic flux can only be switched on and off by energy supply, to avoid accident risks which are interrupted is described. It is recommended that the systems has any lifting capacity, it can take and for hot loads with temperatures of max. 500 deg. C. E.A.K.

N83-21195# Sachs Systetechnik G.m.b.H., Schweinfurt (West Germany).
MOVABLE STORAGE MEANS FOR WORKPIECES Final Report, Jun. 1980
Egon Gueglein Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 224 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-81-022; ISSN-0171-7618) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 38,90

Flexible storage means for workpieces were investigated. Adhesive retaining plattes for presentation and transport of workpieces in the area of production, assembling, storage are tailored to a large extent to the respective workpieces. This happens by fixing studs or by appropriate nests. The above adhesive retaining plate can firmly hold workpieces of different geometry up to a weight of approx. 2 kg against transport vibrations. No adjustment of the pallet to the size or geometry of the workpieces is required. It is found that the flexible storage means for workpieces or adhesive retaining plate is suitable for all usual materials and can be applied to manual and automatic handling. E.A.K.

N83-21196# Arbeitsgemeinschaft Handhabungssysteme, Stuttgart (West Germany).
NEW HANDLING SYSTEMS AS TECHNICAL SUPPORT FOR THE WORKING PROCESS. PART 6: FEEDING DEVICES Final Report, Mar. 1980
H. Becher (Volkswagenwerk AG), R. Burkhardt (Maschinenfab. Augsburg-Nuernberg AG, Munich), Peter Drexel (Bosch (Robert) GmbH, Stuttgart), B. Graf (Inst. fuer Produktionstech. u. Automatisierung), W. Krreis (Ind.-Werke Karlsruhe Augsburg AG), D. Mielke (Volkswagenwerk AG), J. Roesch (Pfaff Industriemaschinen), E. Schmalenbach (IBP Pietzsch GmbH), R. Tradt (Ind.-Werke Karlsruhe Augsburg AG), G. Wauer (Pfaff Industriemaschinen GmbH) et al Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 276 p In GERMAN; ENGLISH summary
(BMFT-FB-HA-82-002; ISSN-0171-7618) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 44

Social, technical and economic reasons require an enhanced application of handling systems such as industrial robots. Quality and efficiency of an industrial robot depends greatly on feeding devices, and the ARGE-HHS within its project new handling systems as a technical aid in the working process intends to analyze all feeding devices that are likely to be most suitable for advanced applications. Forty one feeding devices were developed, known devices were modified, adapted to different applications, and tested. A variety of feeding devices for most applications in the field of material handling is reported. E.A.K.

N83-21197# Army Industrial Base Engineering Activity, Rock Island, Ill. Manufacturing Technology Div.
MANUFACTURING METHODS AND TECHNOLOGY (MMT) PROJECT EXECUTION REPORT Semiannual Report, 1 Jan. - 30 Jun. 1982
P. A. Swim Oct. 1982 174 p
(AD-A122352; SAR-1) Avail: NTIS HC A08/MF A01 CSCL 13/8

This document is a summary compilation of the manufacturing methods and technology program project status reports (RCS DRCMT-301) submitted to IBEA from DARCOM major Army subcommands and project managers. Each page of the computerized section lists project number, title, status, funding, and projected completion date. Summary pages give information relating to the overall DARCOM program. Author (GRA)

N83-21198# Textron, Inc., Springfield, Vt.
HIGH SPEED METAL REMOVAL Final Report, Jan. 1981 - Jan. 1982
Richard F. Pugh and Raymond F. Pohl (Army Armament Research and Development Command, Dover, N.J.) Dover, N.J. Army Armament Research and Development Command Oct. 1982 314 p
(Contract DAAK10-80-C-0029)
(AD-A122282; AD-E400923; ARLCD-SP-82004) Avail: NTIS HC A14/MF A01 CSCL 11/6

Four types of steel (AISI 1340, 4140, 4340, and HF-1) which are commonly used in large caliber projectile manufacture were machined at different hardness ranges representing the as-forged and the heat treated condition with various ceramic tools using ceramic coated tungsten carbide as a reference. Results show that machining speeds can be increased significantly using present available tooling. GRA

N83-21199# Bendix Corp., Kansas City, Mo.
FLAT-CABLE FABRICATION Final Report
K. J. Groot Nov. 1982 22 p
(Contract DE-AC04-76DP-00613)
(DE83-004167; BDX-613-2864) Avail: NTIS HC A02/MF A01

Processes, environment, designs, and materials were reviewed to lower the attrition rate and improve the manufacturing ability of flat, flexible cables. Attrition caused by foreign material, damage, and dents was lowered. A new termination was developed for two cables. An alternative design for Kapton insulated cables reduced notch sensitivity. Alternative methods of cable manufacturing and inspection are investigated. DOE

N83-21200# BDM Corp., Albuquerque, N. Mex.
DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM FOR PHOTOVOLTAIC RESIDENCES IN THE SOUTHWEST Final Report
Aug. 1982 159 p
(Contract DE-AC02-76ET-20279)
(DE83-003935; DOE/ET-20279/225) Avail: NTIS HC A08/MF A01

The design, fabrication, and maintenance of a prototype residential photovoltaic (PV) power system installed and operated at the Southwest Residential Station in Las Cruces, New Mexico is reported. The program identifies and resolves engineering problems that result from the widespread use of residential PV systems. The tasks accomplished are documented and overall system design and performance are evaluated. DOE

N83-21201# Los Alamos Scientific Lab., N. Mex.
THE APPLICATION OF DOE-2 IN THE PREDESIGN PHASE OF COMMERCIAL-BUILDING DESIGN
J. L. Peterson and B. D. Hunn 1982 7 p refs Presented at the Renewable Challenge Solar Technol. Conf. and Intern. Exposition, Houston, Tex., 1-5 Jun. 1982
(Contract W-7405-eng-36)
(DE82-014067; LA-UR-82-989; CONF-820629-8) Avail: NTIS HC A02/MF A01

The results of a study in applying a high level, computer

dynamic tool, DOE-2 was applied to the predesign process for a standard test office building. Fice analysis tools, ranging from manual to computer dynamic methods, were used to provide predesign energy information. Computer dynamic tools, such as DOE-2 and BLAST were tested to determine if they can readily provide the necessary predesign information in a usable visual format and without excessive cost. DOE

N83-21202# Townsend (Anne) Associates, Inc., Arlington, Va.
PASSIVE-SOLAR COMMERCIAL BUILDINGS PROGRAM, 1980 - 1982 Summary Report
Lynn Gialanella Feb. 1982 24 p refs Prepared in cooperation with Rockwell International Corp., Canoga Park, Calif.
(Contract DE-AM03-76SF-00700)
(DE82-012472; DOE/SF-00700/T4) Avail: NTIS HC A02/MF A01

Support of research and development, promotion of utilization, and sponsoring of education and training were summarized. The program structure, approach, systematic overlapping of projects, and accomplishments are detailed. Impacts on the building and design industry are discussed. DOE

N83-21203# Massachusetts Univ., Amherst.
SHORT-CUT PROCEDURES FOR THE SIMULTANEOUS DESIGN OF A PROCESS AND ITS CONTROL SYSTEM Progress Report, 1 Aug. 1981 - 15 Apr. 1982
J. M. Douglas and M. F. Malone Apr. 1982 26 p refs
(Contract DE-AC02-81ER-10938)
(DE82-013509; DOE/ER-10938/1) Avail: NTIS HC A03/MF A01

The energy integration procedures were applied to design heat exchanger networks for a solvent recovery system and for a process for the production of benzene by the hydrode-alkylation of toluene. Several alternative designs satisfying minimum energy requirements were obtained. Each of these alternatives corresponds to different recycle costs, so it is necessary to solve for an optimal design which is coupled to the energy integration analysis. The operability and control characteristics of each design differ. The development of short cut procedures to assess potential problems and costs related to operability and control is underway. Recycle costs and energy integration in chemical processes are coupled. Liquid recycle loops usually involve distillation columns with relatively large energy requirements. Because of this coupling the choice of distillation column configuration is important and costs and energy use can be reduced by including columns with multiple feeds and sidestreams, or by thermally coupled columns. DOE

N83-21204# California Univ., Livermore. Lawrence Livermore Lab.
SEISMIC SAFETY MARGINS RESEARCH PROGRAM. PHASE 1. SOIL, STRUCTURE INTERACTION, PROJECT 3 Final Report
J. J. Johnson (Structural Mechanics Assoc.), O. R. Maslenikov, J. C. Chen, and R. C. Chun Feb. 1982 144 p refs
(Contract W-7405-eng-48)
(DE82-012261; NUREG/CR-2015-Vol-4; UCRL-53021-Vol-4) Avail: NTIS HC A07/MF A01

There were three objectives of the soil-structure interaction (SSI) project of the Seismic Safety Margins Research Program (SSMRP). They were: (1) to model SSI for systems analysis, using state-of-the-art analysis techniques; (2) to identify important parameters in the SSI phenomena through sensitivity studies; and (3) to compare analysis techniques. SSI was modeled in the systems analysis by the substructure approach, as implemented in the CLASSI family of computer programs. The CLASSI formulation clearly separates the roles of earthquake, soil, and structure, a basic requirement of the systems analysis. The calculative process is extremely efficient, as it must be to perform repeated deterministic analyses simulating earthquake occurrences. The SSI input to the system analysis is detailed. SSI analysis of the Zion Nuclear Power Plant was examined in relation to modeling decisions concerning the free-field ground motion and idealizing the soil-structure system. DOE

N83-21205# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
CONSTRUCTION OF AN EXPERIMENTAL SULFUR-EXTENDED-ASPHALT PAVEMENT Interim Research Report
Kenneth S. Dodge Jul. 1982 45 p refs Sponsored in part by Federal Highway Administration
(PB83-118067; RR-96; FHWA/NY/RR-82/96) Avail: NTIS HC A03/MF A01 CSCL 13C

The design, placement and collection of initial data from a sulfur extended asphalt (SEA) pavement and a conventional pavement used as a control is documented. The SEA pavement used 30 percent sulfur by total weight of the binder. Mix temperatures, hot bin gradations, and toxic emissions were monitored at the plant and the site throughout placement. Aggregates were collected from the hot bin during production of the control and SEA mixes for use in a Marshall mix design. Cores were extracted from both SEA and control pavements 1 month after placement for laboratory testing. Pavement surface properties were also examined after 1 month of service. GRA

N83-21206# Nevada Univ., Reno. Coll. of Engineering.
SIMPLE NONLINEAR MODELLING OF EARTHQUAKE RESPONSE IN TORSIONALLY COUPLED R/C STRUCTURES: A PRELIMINARY STUDY
Mehdi Saiidei Jul. 1982 82 p refs
(Grant NSF PFR-80-06423)
(PB83-112821; College-of-Engineering-60; NSF/Cee-82035) Avail: NTIS HC A05/MF A01 CSCL 13M

The equivalent of a single degree of freedom (SDOF) nonlinear model, the Q-model-13, was examined. The study intended to: (1) determine the seismic response of a torsionally coupled building based on the multidegree of freedom (MDOF) and (SDOF) nonlinear models; and (2) develop a simple SDOF nonlinear model to calculate displacement history of structures with eccentric centers of mass and stiffness. It is shown that planar models are able to yield qualitative estimates of the response of the building. The model is used to estimate the response of a hypothetical six-story frame wall reinforced concrete building with torsional coupling, using two different earthquake intensities. It is shown that the Q-Model-13 can lead to a satisfactory estimate of the response of the structure in both cases. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N83-21207*# Communications Satellite Corp., Clarksburg, Md.
PLANNING ASSISTANCE FOR THE NASA 30/20 GHz PROGRAM. NETWORK CONTROL ARCHITECTURE STUDY. Final Report, Mar. 1981 - Mar. 1983
T. Inukai, B. Bonnelycke, and S. Strickland Mar. 1982 240 p refs
(Contract NAS3-22905)
(NASA-CR-168058; NAS 1.26:168058; Rept-110-5) Avail: NTIS HC A11/MF A01 CSCL 17B

Network Control Architecture for a 30/20 GHz flight experiment system operating in the Time Division Multiple Access (TDMA) was studied. Architecture development, identification of processing functions, and performance requirements for the Master Control Station (MCS), diversity trunking stations, and Customer Premises Service (CPS) stations are covered. Preliminary hardware and software processing requirements as well as budgetary cost estimates for the network control system are given. For the trunking system control, areas covered include on board SS-TDMA switch organization, frame structure, acquisition and synchronization, channel assignment, fade detection and adaptive power control, on board oscillator control, and terrestrial network timing. For the

CPS control, they include on board processing and adaptive forward error correction control. Author

N83-21208*# Texas A&M Univ., College Station. Remote Sensing Center.
RADAR CROSS CALIBRATION INVESTIGATION TAMU RADAR POLARIMETER CALIBRATION MEASUREMENTS Final Report
A. J. Blanchard, R. W. Newton, S. Bong, C. Kronke, G. L. Warren, and D. Carey Oct. 1982 55 p
(Contract NAS9-16717)
(NASA-CR-167832; NAS 1.26:167832; FR-RSC-4768) Avail: NTIS HC A04/MF A01 CSCL 17I

A short pulse, 20 MHz bandwidth, three frequency radar polarimeter system (RPS) operates at center frequencies of 10.003 GHz, 4.75 GHz, and 1.6 GHz and utilizes dual polarized transmit and receive antennas for each frequency. The basic lay-out of the RPS is different from other truck mounted systems in that it uses a pulse compression IF section common to all three RF heads. Separate transmit and receive antennas are used to improve the cross-polarization isolation at each particular frequency. The receive is a digitally controlled gain modulated subsystem and is interfaced directly with a microprocesser computer for control and data manipulation. Antenna focusing distance, focusing each antenna pair, rf head stability, and polarization characteristics of RPS antennas are discussed. Platform and data acquisition procedures are described. A.R.H.

N83-21209*# Tufts Univ., Medford, Mass. Dept. of Engineering Design.
SIMULATION FIDELITY AND NUMEROSITY EFFECTS IN CDTI EXPERIMENTATION Final Report
John G. Kreifeldt Jan. 1983 10 p refs
(Contract NCC2-93)
(NASA-CR-166459; NAS 1.26:166459) Avail: NTIS HC A02/MF A01 CSCL 17B

Twenty pilot workload assessment techniques were compared using a simulated flying task in which three levels of psychomotor workload were imposed. The experiment was conducted in a three degree of freedom motion base simulator. Opinion measures, spare mental capacity measures, physiological measures, eye movement behavior and primary task performance measures were evaluated. The primary task was an instrument landing system (ILS) approach and landing. All measures were recorded between the outer and middle markers on the approach. Three levels of psychomotor load were obtained by the combined manipulation of wind gust disturbance level and simulated aircraft pitch stability. Six instrument rated general aviation pilots participated in the experiment. Cooper-Harper ratings, WCI/TE ratings, time estimation standard deviation, pulse rate mean, and control movements per unit time demonstrated sensitivity to psychomotor load. No intrusion into primary task performance was found that the sensitivities of workload estimation techniques vary widely, and that only a few techniques appear to be sensitive to psychomotor load. A.R.H.

N83-21210*# Tufts Univ., Medford, Mass. Dept. of Engineering Design.
MULTI-MAN FLIGHT SIMULATOR Progress Report, Oct. 1979 - Sep. 1980
Gary MacDonald Feb. 1983 44 p refs
(Grant NsG-2156)
(NASA-CR-166449; NAS 1.26:166449) Avail: NTIS HC A03/MF A01 CSCL 17B

A prototype Air Traffic Control facility and multiman flight simulator facility was designed and one of the component simulators fabricated as a proof of concept. The facility was designed to provide a number of independent simple simulator cabs that would have the capability of some local, stand alone processing that would in turn interface with a larger host computer. The system can accommodate up to eight flight simulators (commercially available instrument trainers) which could be operated stand alone if no graphics were required or could operate in a common simulated airspace if connected to the host computer. A proposed addition to the original design is the capability of inputing pilot inputs and quantities displayed on the flight and navigation instruments to the microcomputer when the simulator operates in the stand alone mode to allow independent use of these commercially available instrument trainers for research. The conceptual design of the system and progress made to date on its implementation are described. Author

N83-21211# Library of Congress, Washington, D. C. Science and Technology Div.
TELECOMMUNICATIONS AND TOMORROW
Alexander Hromocky, comp. Aug. 1981 10 p
(ISSN-0090-5232; TB-81-8) Avail: NTIS HC A02/MF A01

The various subject heading used by the Library of Congress, under which most books on telecommunications can be located in card, book, and online catalogs are listed. Recommended literature from the library's collections is cited in this noncomprehensive bibliography intended for those interested in studying the technological, social, and policy aspects of telecommunications. The library's classification number is given for the books, journal articles, government publications, conference proceedings, and technical reports, recommended all of which are listed by author entry. Abstracting and indexing services that cover relevant literature are included. A.R.H.

N83-21212# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
EN ROUTE MOVING TARGET DETECTOR (MTD) 2: TEST AND EVALUATION Final Report, Nov. 1979 - Sep. 1981
Harold R. Kleuskens, Eric W. Hess, and Michael S. Hulse Washington Nov. 1982 40 p refs
(FAA Proj. 022-243-810)
(FAA-RD-82-34; FAA-CT-82-4) Avail: NTIS HC A03/MF A01

The moving target detector (MTD) 2 is a sophisticated signal processor designed to provide improved radar detection of aircraft in the air traffic control environment, particularly in areas of heavy radar clutter. The MTD 2 was installed on one channel of the FPS-67B en route surveillance radar. The operational performance of the MTD 2 was compared with that of the common digitizer (CD) operating with the other radar channel. Performance relative to percentage of target detection, false alarm rate, interference reduction, processor improvement factor, subclutter visibility, system dynamic range, velocity response, and flight testing of the MTD 2A and CD equipped radar channels are covered. The results of the test show that the MTD 2 provides performance superior to that of the CD. S.L.

N83-21213*# Purdue Univ., Lafayette, Ind.
THE RELATIONSHIP OF SENSOR PARAMETERS TO APPLICATIONS DATA ANALYSIS Final Report, May 1981 - Aug. 1982
David A. Landgrebe and Eric R. Malaret [1982] 80 p refs
(Grant NsG-5414)
(NASA-CR-170120; NAS 1.26:170120) Avail: NTIS HC A05/MF A01 CSCL 20N

A stochastic model for the data acquisition system in a multispectral scanner system, like the one utilized by the LANDSAT satellites, is presented. A list of noise sources which are known or presumed to have a significant effect in the information extraction process was constructed. Since the shot noise introduced by the photodetectors in the sensor system is signal level dependent, an atmospheric model was adopted which could adequately describe the amount of radiation that gets into the sensors based on the atmospheric transmittance. An analysis was carried out to find the output spectral statistics in terms of the input signal statistics and the system parameters. This was integrated into a set of FORTRAN programs that when supplied with, the class statistics, the noise levels introduced by the sensor system, the atmospheric transmittance, and the atmospheric path radiance, can be used to estimate the classification performance. In order to show the benefits of this model a series of runs were performed in which the Thematic Mapper multispectral scanner was the system under consideration. S.L.

N83-21214# Finnish Meteorological Inst., Helsinki.
OBSERVATIONS OF RADIOACTIVITY, 1980
1982 68 p refs
(Observations-of-Radioact-20; ISBN-951-697-187-3; ISSN-0071-5220) Avail: NTIS HC A04/MF A01

Measurements of radionuclides in the air and rainwater are considered to be an essential part of meteorological observations. The fraction of aerosol beta activity that decays within 4 hours, the one that remains five days after the end of the sampling period are presented. Measurements of beta activity in precipitation and settled dust collected are included. Additional measurements of fission products in the air were carried out. S.L.

N83-21215# TICRA ApS, Copenhagen (Denmark). Communications Systems and Antennas Div.
STUDY OF SOFTWARE FOR OPTIMIZATION OF CONTOURED BEAM REFLECTOR ANTENNAS. VOLUME 1: SUMMARY REPORT
P. Balling, R. Joergensen, P. H. Nielsen, K. Pontoppidan, G. Anteborn (L.M. Ericsson), P. Ingvarson (L.M. Ericsson), J. Lindh (L.M. Ericsson), P. Malmborg (L.M. Ericsson), and V. Sohtell (L.M. Ericsson) Paris ESA Jan. 1981 35 p 2 Vol.
(Contract ESTEC-4188/79/NL-DG(SC))
(S-128-04; ESA-CR(P)-1669-Vol-1) Avail: NTIS HC A03/MF A01

High-gain antennas with contoured beams are envisaged in future satellite systems, e.g., telecommunications and direct broadcast. The principal contoured-beam antenna concept considered involves the use of a large reflector system in combination with a multiple-feed array. The synthesis software developed under a previous contract was updated and validated. Detailed instruction for the use of the software is given. Extensive comparisons were carried out for two experimental test cases involving measured primary and secondary patterns. To demonstrate an alternative to the reflector antenna with a multi-element feed array in case of a fixed contoured beam, the limitations of shaped single reflectors were examined. Author

N83-21216# TICRA ApS, Copenhagen (Denmark).
STUDY OF SOFTWARE FOR OPTIMIZATION OF CONTOURED BEAM REFLECTOR ANTENNAS, VOLUME 2 Final Report
P. Balling, R. Joergensen, P. H. Nielsen, K. Pontoppidan, G. Anteborn (L.M. Ericsson), P. Ingvarson (L.M. Ericsson), J. Lindh (L.M. Ericsson), P. Malmborg (L.M. Ericsson), and V. Sohtell (L.M. Ericsson) Paris ESA Jan. 1981 411 p refs 2 Vol.
(Contract ESTEC-4188/79/NL-DG(SC))
(S-128-02; ESA-CR(P)-1669-Vol-2) Avail: NTIS HC A18/MF A01

A step-by-step synthesis procedure, a simple analytic element beam model, optimization routines, a fast analysis program, feed element modelling, an experimental test case, check of COBRA software, European Communications Satellite antenna synthesis, and reflector antenna shaping limitations are discussed. Author

N83-21217# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
PULSE SIGNALS IN HETERODYNE AND HOMODYNEDETECTION
Friedrich Malota Aug. 1982 39 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-809)
(DFVLR-Mitt-82-13) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 13,40

The signals where calculated, which are produced in a detector, when pulses of a transmitter are superimposed with the CW radiation of a local oscillator are presented. This is done for the heterodyne and homodynedetection. Beside of the combination pulses CW radiation, other possible combinations are given. Author (ESA)

N83-21218*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abteilung Turbulenzforschung.
EXCITED WAVES IN SHEAR LAYERS
Dietrich W. Bechert Apr. 1982 151 p refs
(Grant NAG3-1981; DFG-BE-889/1-1)
(DFVLR-FB-82-23) Avail: NTIS HC A08/MF A01

The generation of instability waves in free shear layers is investigated. The model assumes an infinitesimally thin shear layer shed from a semi-infinite plate which is exposed to sound excitation. The acoustical shear layer excitation by a source further away from the plate edge in the downstream direction is very weak while upstream from the plate edge the excitation is relatively efficient. A special solution is given for the source at the plate edge. The theory is then extended to two streams on both sides of the shear layer having different velocities and densities. Furthermore, the excitation of a shear layer in a channel is calculated. A reference quantity is found for the magnitude of the excited instability waves. For a comparison with measurements, numerical computations of the velocity field outside the shear layer were carried out. M.G.

N83-21219# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung HF-Systeme.
L-BAND SATELLITE COMMUNICATION EXPERIMENT IN THE ANTARCTIC
Daniel T. Salzer Aug. 1982 35 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-805)
(DFVLR-FB-82-24) Avail: NTIS HC A03/MF A01

A satellite communication experiment performed in the Antarctic is described. A satellite receiving station, installed on the Argentinian anarctic station General Belgrano II was used. The measurement signal was the L-band beacon from the Atlantic Ocean MARISAT Satellite. The elevation angle was approximately 3 deg. The results show unexpected high variations of the amplitude of the received signal which strongly influence satellite communications in the antarctic region. Due to the daily and seasonal variations of the amplitude and frequency of the received signal, the ionosphere could be the origin of these effects. S.L.

N83-21220# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VHF PROPAGATION NEAR THE GROUND: AN INITIAL STUDY
M. Littleton Meeks 26 Oct. 1982 93 p refs
(Contract F19628-80-C-0002; ARPA Order 3724)
(AD-A122498; CMT-35; ESD-TR-82-094) Avail: NTIS HC A05/MF A01 CSCL 20/14

This report describes an initial investigation of propagation near the ground in forested terrain at a frequency of 110.6 MHz. The objective was to study propagation effects that influence the illumination of ground-clutter targets by a ground-based radar. We used as a transmitter an aircraft-navigation aid, the VHF omnidirectional range at Gardner, Massachusetts. Ground-based measurements of signal strength at heights from 2 to 15 ft above the ground were made at two locations, 2.2 and 8.8 miles away, and the field strengths corresponding to free-space propagation at each location were measured with a helicopter hovering over the site of the ground-based measurements at sufficient altitude to avoid terrain-diffraction effects. The results of the ground-based measurements are compared with calculations that model the propagation effects on the basis of terrain profiles determined directly from relief maps with corrections for tree height. The model took into account diffraction by masking hills. In addition specular reflection from the open fields immediately in front of the receiving antenna at both sites was found to produce the steep gradients in field strength observed below a height of 10 ft above ground. GRA

N83-21221# Signal Technology, Inc., Goleta, Calif.
VECTOR/MATRIX QUANTIZATION FOR NARROW-BANDWIDTH DIGITAL SPEECH COMPRESSION Final Technical Report, 13 Jan. 1981 - 13 May 1982
David Y. Wong Griffiss AFB, N.Y. RADC Sep. 1982 81 p refs
(Contract F30602-81-C-0054; AF Proj. 4594)
(AD-A122519; RADC-TR-82-246) Avail: NTIS HC A05/MF A01 CSCL 17/2

Speech compression techniques for very low data rate compression are studied. The techniques are based on a standard LPC analysis/synthesis (vocoder) system. Significant advances are made in the quantization algorithms to achieve bit rates of 200 to 400 bps. Frame predictive vector quantization is developed to compress the bit rate for the LPC model filter top under 250 bps. The vector quantization technique developed applies to continuous speech and is independent of both speaker and vocabulary. An innovative LPC compression technique, matrix quantization, is also developed to compress the LPC model filter to a rate under 150 bps. The design is applicable to continuous speech and unlimited vocabulary. At this stage of development, it is adapted to a single speaker, but theoretically it can be generalized to a selection of speakers or even the general population. Subjective evaluation of both the vector and matrix LPC quantization approaches using the diagnostic rhyme test (DRT) has been performed and the test scores are analyzed in detail. The results indicate that the proposed techniques are feasible for intelligible speech transmission at bit rates of 400 bps and 200 bps. GRA

N83-21222# Mitre Corp., Bedford, Mass.
INPUT PARAMETER SPECIFICATION FOR THE LONGLEY-RICE AND JOHNSON-GIERHART TROPOSPHERIC RADIO PROPAGATION PROGRAMS, 0.02-40 GHz
M. M. Weiner, E. Jappe, and N. J. Johnson Oct. 1982 98 p refs
(Contract F19628-82-C-0001; AF Proj. 6480)
(AD-A122582; MTR-8737; ESD-TR-82-400) Avail: NTIS HC A05/MF A01 CSCL 17/2

The Longley-Rice and Johnson-Gierhart prediction programs are statistical/semi-empirical models of tropospheric radio propagation for low and high altitude scenarios, respectively, in the frequency range 0.02-40 GHz. These programs have been acquired by the MITRE Corporation and have been made compatible with the IBM-370 computer at MITRE, Bedford. This report describes these programs with particular emphasis on input parameter specification. GRA

N83-21223# Lincoln Lab., Mass. Inst. of Tech., Lexington. Group 61.
CONSUMPTION OF DEGREES OF FREEDOM IN ADAPTIVE NULLING ARRAY ANTENNAS
Alan J. Fenn 12 Oct. 1982 76 p refs
(Contract F19628-80-C-0002; AF Proj. 2029; AF Proj. 6430)
(AD-A122389; TR-609; ESD-TR-82-089) Avail: NTIS HC A05/MF A01 CSCL 09/5

A gradient search technique is used to maximize consumption of the degrees of freedom for N-channel adaptive nulling phased array antennas. The technique is based on a figure of merit which seeks to maximize the sum of the square roots of the interference covariance matrix eigenvalues. Equivalently, the worst case interference source configuration attempts to completely consume N degrees of freedom of the adaptive nulling antenna. Results are given for several basic regularly spaced arrays. The technique can be applied to a phased array with arbitrary array element positions. Author (GRA)

N83-21224# Georgia Inst. of Tech., Atlanta.
ANALYSIS OF A POLARIZATION DIVERSITY WEATHER RADAR DESIGN Final Report, 1 Oct. 1980 - 30 Jun. 1982
J. S. Ussailis, L. A. Leiker, R. M. Goodman, IV, and J. I. Mecalf (AFGL) 2 Jul. 1982 112 p refs
(Contract F19628-81-K-0027; AF Proj. 6781)
(AD-A121666; AFGL-TR-82-0234) Avail: NTIS HC A06/MF A01 CSCL 17/9

This report focuses not only on a design for a pulse to pulse polarization diversity modification of the Air Force Geophysics Laboratory (AFGL) S-band Doppler weather radar, but also upon the meteorological and technical requirements of such a radar. The theoretical aspects of and physical limitations imposed by the polarization diversity requirement are presented independently of this design and as a result are applicable towards the development of any similar system. The antenna modification could also be applied towards the general case, excepting the condition imposed in this design that the present 24 foot diameter reflector be retained. Formulae are developed to demonstrate the various uncertainties for the system as a whole and the antenna in particular. Tradeoffs between the various meteorological measurement goals vs available and constructible radio frequency components are presented. GRA

N83-21225# Naval Research Lab., Washington, D. C.
PHASED ARRAY LENS RADAR SYSTEM WITH SHARED SOLID-STATE MODULES
T. C. Cheston 26 Nov. 1982 13 p refs
(AD-A121659; NRL-MR-4963) Avail: NTIS HC A02/MF A01 CSCL 17/9

A novel phased array system is described where solid-state T/R modules, which include diode phaseshifters, are shared between two apertures. Two such systems are required for hemispherical coverage. Efficient and cost-effective operation is claimed. Author (GRA)

N83-21226# Naval Research Lab., Washington, D. C.
THE ROLE OF THE PROPAGATION ENVIRONMENT IN HF ELECTRONIC WARFARE
J. M. Goodman and D. R. Uffelman 23 Nov. 1982 32 p refs
(AD-A121658; NRL-MR-4953) Avail: NTIS HC A03/MF A01 CSCL 17/4

The HF propagation channel is characterized by its inextricable relationship to the ionospheric medium; and because the medium is variable in both space and time, the channel is itself a temporally and spatially-varying entity. The nature of the channel has been the subject of continuous investigation over the years and models of propagation effects have been developed to assist in communication system design and in operational frequency management. HF communication system sensitivity to ionospheric disturbances is well known and the role of the benign ionosphere in affecting efficient skywave communication is acknowledged. NRL is investigating various remote sensing schemes including terrestrial-oblique and satellite-borne ionosonde to serve as update tools in the specification of the ionosphere. It has been shown by NRL tests that ionospheric specifications using these tools may be useful over an extended geographical zone. Furthermore, temporal extrapolation (i.e., forecasting) may be satisfactory for up to 24 hours provided the forecast is not obviated by unexpected intense solar and magnetic activity. Following identification of certain well known propagation principles, this paper outlines how quasi-real time propagation data may be utilized to engage in operationally-viable propagation tactics. GRA

N83-21227# Naval Research Lab., Washington, D. C. Airborne Radar Branch.
ADAPTIVE ANTENNA SUBARRAYING USING A WEIGHTED BUTLER MATRIX Interim Report
Karl R. Gerlach and G. A. Andrews 30 Sep. 1982 22 p refs
(XF12141370)
(AD-A121641; AD-E000510; NRL-8636) Avail: NTIS HC A02/MF A01 CSCL 09/5

An effective scheme for subarraying an antenna array is presented. The subarray technique uses a partitioned weighted Butler matrix transform where the partition is an adapting function of the geometry of the noise environment. After subarraying, the subarrayed outputs are adaptively weighted in such a way so as to maximize the output signal-to-noise ratio. It is shown that this technique effectively cancels sidelobe jamming without significantly degrading the signal-to-noise ratio that is possible if the entire array is used for adaptation. In addition it is shown that the effective reduction in dimensionality decreases the convergence time of the adapting weights and that the convergence time is independent of the array size. GRA

N83-21228# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PROGRESS ON SATNET DEVELOPMENT AND OPERATION, PLURIBUS SATELLITE IMP DEVELOPMENT, REMOTE SITE MAINTENANCE, INTERNET OPERATIONS AND MAINTENANCE,

MOBILE ACCESS TERMINAL NETWORK, TCP FOR THE HP3000 AND TCP FOR VAX-UNIX Quarterly Technical Report, 1 Aug. - 31 Oct. 1982
J. F. Haverty Nov. 1982 65 p
(Contracts MDA903-80-C-0353; MDA903-80-C-0214; N00039-82-C-0516; N00039-80-C-0664; N00039-81-C-0408; ARPA Order 3214)
(AD-A122596; BBN-5215; CQTR-27) Avail: NTIS HC A04/MF A01 CSCL 17/2

This is the current edition in a series of reports which describe the work being performed at BBN in fulfillment of several ARPA work statements. It covers work on several ARPA-sponsored projects including: (1) development and operation of the SATNET satellite network; (2) development of the Pluribus Satellite IMP; (3) Remote Site Maintenance activities; (4) Internet Operations, Maintenance, and Development; (5) development of the Mobile Access Terminal Network; (6) TCP for the HP3000; and (7) TCP for the VAX-UNIX. Author

N83-21229# Aeronautical Research Associates of Princeton, Inc., N. J.
NAVAL WEAPONS CENTER PLUME RADAR FREQUENCY INTERFERENCE CODE Final Report, 8 May 1981 - 24 Jun. 1982
Blaine E. Pearce and Robert W. McCullough Oct. 1982 157 p refs
(Contract N60530-81-C-0254)
(AD-A122803; ARAP-467; NWC-TP-6386) Avail: NTIS HC A08/MF A01 CSCL 17/9

A description of the Naval Weapons Center Plume Radar Frequency Interference Code (PRFIC) is given. The methods used to predict the attenuation and phase shifts contributed by the mean plume flowfield, and the scattering and Doppler shift due to turbulent fluctuations, are defined. Examples of the predictions of the plume RF interference using the flowfield predictions of a modified JANNAF Standard Plume Flowfield code are given. The capabilities and limitations of PRFIC are listed and improvements are proposed. A code user's manual and software description are included. Author (GRA)

N83-21230# Naval Research Lab., Washington, D. C. Search Radar Branch.
ORTHOGONAL PULSE COMPRESSION CODES FOR M-ary COMMUNICATION Interim Report
W. M. Waters 26 Nov. 1982 15 p refs
(AD-A122338; AD-E000514; NRL-MR-4962) Avail: NTIS HC A02/MF A01 CSCL 17/2

An M-ary communication channel is described employing orthogonal pulse compression waveforms. An example is presented and analyzed based upon maximum length 7 stage binary shift register (SR) codes (M = 16). Curves of error probability are computed from M-ary communication theory fundamentals and the 7 bit SR code example is shown to provide acceptable error probability (less than 0.00001) for output signal to noise ratio above 17 dB based upon 120 calculated cross-correlation functions.GRA

N83-21231# Naval Research Lab., Washington, D. C. Radar Analysis Branch.
RAIN CLUTTER STATISTICS Interim Report
William B. Gordon and Jon D. Wilson 30 Sep. 1982 25 p refs (RR0210541)
(AD-A122339; AD-E000513; NRL-8639) Avail: NTIS HC A02/MF A01 CSCL 17/9

Measurements of rain clutter were taken with a frequency-agile S-band radar for the purpose of studying the Doppler power spectra and the variation of backscattered power with space, time, and frequency. The clutter was found to be nonhomogeneously distributed in both space and time, but the relation of mean backscattered power to frequency seemed to involve only a single parameter having a spatial and temporal variation. Although the radar was looking into the surface wind, a significant portion of the backscattered signal energy was always found to lie in the negative frequency range, suggesting a wind shear, estimated to be about 8 m/s per km. The Doppler power spectra were sometimes found to have multiple peaks at both positive and negative Doppler frequencies, and from measurements of the peak widths it appears that they were produced by horizontal bands or clumps of clutter whose vertical extent was of the order of 200 m. Another possibility for the production of multiple spectral peaks is Bragg scattering from turbulent eddies. However, using statistical methods which are valid in the presence of calibration errors and noise, it was established that the data favored the vertical-stratification mode over the Bragg-scattering model. The nonhomogeneity of the clutter and the existence of Doppler spectra with multiple peaks have serious implications for the performance and design of detectors. GRA

N83-21232# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE OVERALL STATE AND OUTLOOK FOR THE DEVELOPMENT OF DIGITAL SYSTEMS IN POLAND
Jan Kolodziejczak and Bogdan Czajka 29 Nov. 1982 16 p refs Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), no. 8, 1980 p 251-254
(AD-A122808; FTD-ID(RS)T-1307-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

The history of the introduction of digital systems with pulse code modulation into existing telephone networks is reviewed. Plans for developing wide band coding equipment for analog-to-digital and digital-to-analog radio and television broadcasting signal conversions are examined. GRA

N83-21233# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODELING A DATA TRANSMISSION NETWORK BY MEANS OF THE TELEDACYA INFORMATION SUBSYSTEMS
Krystyna Palmowska 17 Nov. 1982 9 p Transl. into ENGLISH from Prace Instytutu Lacznosci (Poland), no. 84, 1978 p 125-129
(AD-A122782; FTD-ID(RS)T-1241-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Rapid assessment of the reasonableness of results from various kinds of prognostication fundamentals and assumptions concerning the development of data transmission networks, important with respect to the extent of loading on a long distance telecommunications transmission network was examined. Initial evaluations demonstrated that loading determined according to existing prediction methods has essential importance for the planning of an entire telecommunication network. B.G.

N83-21234# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DIGITAL MULTIPLEXING SYSTEM OF THE TCC 120 TYPE
Bogdan Czajka and Witold Wienskowski 23 Nov. 1982 23 p refs Transl. into ENGLISH from Przegl. Telekomun. (Poland), v. 52, no. 9, 1979 p 260-265
(AD-A122784; FTD-ID(RS)T-1275-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Multichannel telephone systems were introduced into Poland's communications network using time division channels. The implications of this problem area have increased significantly in connection with startup of production and the introduction into use of electronic telephone centrals of the E-10 system, which has created, additionally, the need for digital telecommunications transmission systems. For the purposes of meeting these needs, 30 channel telephone equipment of the TCK 30 type was developed and introduced into production and use, using pulse code modulation. The next step in the development of digital systems involves second order digital multiplexing equipment of the TCC 120 type. This equipment serves for multiplexing for time simultaneous digital signals of 2048 kbits/s in the transmission section during a sequence of secondary signals of 8448 kbit/s, as well as the formation of four component signals with the above named speeds in the reception portion. GRA

N83-21235# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DIGITAL TRANSMISSION IN MOBILE ULTRASHORTWAVE COMMUNICATIONS
Aleksy Pankow 12 Nov. 1982 21 p refs Transl. into ENGLISH from Przeglad Telekomunikacyjny (Poland), v. 50, no. 5, 1977 p 134-139
(AD-A122801; FTD-ID(RS)T-1242-82) Avail: NTIS HC A02/MF A01 CSCL 17/2

Digital transmission in mobile communication networks were investigated. Some basic advantages in the development of digital transmission are: (1) possibility of more efficient organization of communication systems and greater efficiency of the system; (2) high likelihood of transmitting information and possibility of documenting transmitted text; (3) unlimited possibilities for secrecy of transmitted information; (4) possibility of interacting with stationary remote data transmission systems; (5) high interference immunity; (6) possibility of transmitting information in the absence of subscribers. DOE

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N83-21236*# Westinghouse Electric Corp., Lima, Ohio. Electrical Systems Div.
KILOVOLT DC SOLID STATE REMOTE POWER CONTROLLER DEVELOPMENT Final Report
J. T. Mitchell Oct. 1982 169 p
(Contract NAS3-22646)
(NASA-CR-168041; NAS 1.26:168041; WESDL-82-07E) Avail: NTIS HC A08/MF A01 CSCL 09C

The experience gained in developing and applying solid state power controller (SSPC) technology at high voltage dc (HVDC) potentials and power levels of up to 25 kilowatts is summarized. The HVDC switching devices, power switching concepts, drive circuits, and very fast acting overcurrent protection circuits were analyzed. A 25A bipolar breadboard with Darlington connected switching transistor was built. Fault testing at 900 volts was included. A bipolar transistor packaged breadboard design was developed. Power MOSFET remote power controller (RPC) was designed. Author

N83-21237*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTROSTATIC DISCHARGE CONTROL FOR STDN STATIONS
John McKiernan Feb. 1983 34 p refs
(NASA-CR-170029; NAS 1.26:170029) Avail: NTIS HC A03/MF A01 CSCL 09C

This manual defines the requirements and control methods necessary to control the effect of electrostatic discharges that damage or destroy electronic equipment components. Test procedures for measuring the effectiveness of the control are included. A.R.H.

N83-21238*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPARATUS AND METHOD FOR TRACKING THE FUNDAMENTAL FREQUENCY OF AN ANALOG INPUT SIGNAL Patent Application
Gerald Temple, inventor (to NASA) Filed 24 Jan. 1983 26 p
(NASA-Case-ARC-11367-1; US-Patent-Appl-SN-460511) Avail: NTIS HC A03/MF A01 CSCL 09C

The phase locked loop includes a first comparator for converting only the fundamental analog frequency into a digital input signal, and a voltage controlled oscillator which produces a digital output signal. The input and output signals are fed into a digital phase detector, which compares the phase of the digital input and output signals, and produces an error signal whose average voltage is proportional to the difference in phase between the input and output signals. An integrator and low pass filter integrates and filters the error signal, which then enters the voltage controlled oscillator. The voltage controlled oscillator produces an output signal whose frequency is proportional to the DC voltage error signal. NASA

N83-21239# Thorn EMI, Hayes (England).
A HIGH POWER, PULSED, MICROWAVE AMPLIFIER FOR A SYNTHETIQUE APERTURE RADAR ELECTRICAL MODEL. PHASE 1: DESIGN
J. E. Atkinson, G. G. Barker, S. J. Feltham, S. Gabrielson, P. C. Lane, V. J. Matthews, D. Perring, J. P. Randall, J. W. Saunders, and R. A. Tuck Paris ESA May 1982 220 p refs
(Contract ESA-4981/81/NL-PP(SC))
(EVT-742; ESA-CR(P)-1652) Avail: NTIS HC A10/MF A01

An electrical model klystron amplifier was designed. Its features include a gridded gun, a single stage depressed collector, a rare earth permanent magnet focusing system, an input loop, six rugged tuners and a coaxial line output section incorporating a coaxial-to-waveguide transducer and a pillbox window. At each stage of the design, the thermal and mechanical aspects were investigated and optimized within the framework of the RF specification. Extensive use was made of data from the preliminary design study and from RF measurements on the breadboard model. In an additional study, a comprehensive draft tube specification has been produced. Great emphasis has been laid on a second additional study on space-qualified materials and processes. Author (ESA)

N83-21240# European Space Agency, Paris (France).
ECS DATA BOOK
N. Longdon, ed. and G. Levy, ed. May 1982 43 p Original contains color illustrations
(ESA-BR-08; ISSN-0250-1589) Avail: NTIS HC A03/MF A01

Germany acts as a switching center for the land line telephone systems of Europe. Land lines are permanently placed, and once in position flexibility can only be achieved by adding further lines, with additional complications of routing. The use of satellite communications systems can provide an extremely flexible method, for Earth stations can be set up where needed, including many remote areas where it would be uneconomical to install land lines. Land lines require regular servicing over long distances, and in times of political strain are easily disrupted. Earth stations, on the other hand, can be transferred when demands change, and can also be updated more readily. A comparison of economic costs is also interesting: land lines are more economic for shorter distances, but for the longer links it is cheaper to use satellite systems. Author

N83-21241# Arizona Univ., Tucson. Dept. of Psychology.
WHAT PEOPLE KNOW ABOUT ELECTRONIC DEVICES: A DESCRIPTIVE STUDY
David E. Kieras 1 Oct. 1982 60 p refs
(Contract N00014-81-C-0699; NR Proj. 157-473)
(AD-A122189; Rept-12; UARZ/DP/TR-82/ONR-12) Avail: NTIS HC A04/MF A01 CSCL 09/3

Informal descriptive results on the nature of people's natural knowledge of electronic devices are presented. Expert and nonexpert subjects were given an electronic device to examine and describe orally. The devices ranged from familiar everyday devices, to those familiar only to the expert, to unusual devices unfamiliar even to an expert. College students were asked to describe everyday devices from memory. The results suggest that device knowledge consists of the major categories of what the device is for, how it is used, its structure in terms of subdevices, its physical layout, how it works, and its behavior. A preliminary theoretical framework for device knowledge is that it consists of a hierarchy of schemas, corresponding to a hierarchial decomposition of the device into subdevices, with each level containing the major categories of information. GRA

N83-21242# General Electric Co., Schenectady, N. Y. Electric Utility Systems Engineering Dept.
HVDC SYSTEM CONTROL FOR DAMPING OF SUBSYNCHRONOUS OSCILLATIONS Final Report
R. J. Piwko and E. V. Larsen Oct. 1982 206 p refs Sponscred by Electric Power Research Inst.
(EPRI Proj. 1425-1)
(DE83-900539; EPRI-EL-2708) Avail: NTIS HC A10/MF A01

Field tests revealed that HVDC transmission systems can exert a destabilizing influence on turbine generator torsional vibrations, and resulted in a research project, to further understand this phenomenon and develop solutions. Investigation of the interaction characteristics revealed that the destabilizing influence on rotor torsionals is due primarily to the constant current or constant power control method employed in virtually all HVDC systems. Thus, the research effort was directed towards modifications of the HVDC converter's current control loop; in concept by adding a control function, a subsynchronous damping controller (SSDC). A method for designing an SSDC; results from SSDC performance tests performed on both digital simulation programs and an HVDC simulator; SSDC application guidelines; and a design concept of an SSDC to solve subsynchronous resonance (SSR) problems due to series capacitor compensated ac transmission lines are presented. DOE

N83-21243# Brand-Rex Div., Willimantic, Conn.
LIGHTWEIGHT ELECTRIC POWER CABLE Final Technical Report, 30 Sep. 1981 - 30 Sep. 1982
Irving N. Dwyer, Charles J. ONeil, William G. Wood, and David P. DaVia Sep. 1982 39 p refs
(Contract DAAK70-81-C-0190)
(AD-A122244) Avail: NTIS HC A03/MF A01 CSCL 09/1

A TPE (Elexar 8614Z) material was selected from several candidates for evaluation in completed cable form. A second cable with higher heat resistance capability, using silicone insulation, was also evaluated. The objective was to produce a finished cable with a weight savings of 15% or better, with no loss of significant properties from the standard cable specified by Drawing 1322-2E8995. A weight savings of 21% was achieved conforming to the required specification. The jacket material utilized was polyurethane, producing a thinner layered construction over the standard cable. The performance of this, as a sheath material, was excellent when tested to the requirements of MIL-C-13777G. Author (GRA)

N83-21244# Georgia Inst. of Tech., Atlanta.
INVESTIGATION OF INTERMODULATION PRODUCTS GENERATED IN COAXIAL CABLES AND CONNECTORS Final Technical Report, Jan. 1981 - Apr. 1982
J. A. Woody and T. G. Shands Griffiss AFB, N.Y. RADC Sep. 1982 136 p refs
(Contract F30602-81-C-0059; AF Proj. 2338)
(AD-A122634; GIT-A-2845-F; RADC-TR-82-240) Avail: NTIS HC A07/MF A01 CSCL 17/2

This program was performed to investigate the parameters that may affect the generation of intermodulation (IM) products within typical coaxial cables and connectors. The parameters investigated include physical and material properties of the test components as well as electromagnetic properties of the applied signals. A repeatable measurement scheme capable of measuring very low level IM products was developed and evaluated. This test setup was used to measure the IM levels producted by 83 test samples selected to be representative of the coaxial cables and connectors employed on Command, Control, and Communications (C3) platforms. Mathematical models were developed which describe the IM behavior of these cables and connectors as a function of the various parameters investigated. In order to verify the cable-connector model, the IM levels of 21 additional test samples were predicted and then measured. The cable-connector combination model effectively predicts the IM levels within + or -4 dB as a function of each parameter except frequency; it predicts the variation with frequency to within 10 dB over the 20 to 450 MHz frequency range. Author (GRA)

N83-21245# Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
MEASUREMENT OF FRACTIONAL EFFICIENCY OF ELECTRIFIED FILTERS AS A FUNCTION OF ELECTROSTATIC CHARGE AND AERODYNAMIC DIAMETER OF PARTICULATES
M. K. Mazumder, R. E. Ware, P. C. McLeod, and J. R. McConnell 3 Sep. 1982 22 p refs
(Contract W-7405-eng-48)
(DE83-000753; UCRL-15486) Avail: NTIS HC A02/MF A01

An experimental filter test apparatus was installed to test electrified prefilters for their collection efficiency as a function of particle charge and size distributions. The experimental setup includes an electrical single particle aerodynamic relaxation time (F-SPART) analyzer that measures both the particle size and charge distributions simultaneously in real time. Other test analyzers used include a Climet optical particle counter (OPC), an electrometer, a photometer, and instruments for measuring flow, temperature, and humidity. The E-SPART analyzer was calibrated against the Climet OPC for the size distributions, and the electrometer for the charge distributions. The collection efficiency of the prefilters in relation to several experimental parameters was measured. It is indicated that the E-SPART analyzer can be used for rapid testing of the electrostatic filters. DOE

N83-21246# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
HALL-FIELD LIMITATIONS IN MDH GENERATORS
Wahid L. Hermina Apr. 1982 327 p refs
(Contracts DE-AC01-80ET-15611; EX-76-C-01-2341)
(DE83-001149; HTGL-229) Avail: NTIS HC A15/MF A01

An experimental and theoretical study of Hall field limitations in clean fuel combustion-driven MHD generators has been completed. The purpose of this study has been to understand the processes leading up to both insulator and plasma initiated interelectrode breakdown. The present work has been most concerned with insulator initiated breakdown as a result of the lower breakdown thresholds for this breakdown mode as compared to the plasma initiated breakdown mode. The experimental work consisted of two sets of experiments. In the first set, several interelectrode insulator cooling techniques were studied for the purpose of extending the insulator initiated breakdown threshold to higher voltages. The second set of experiments dealt with the dependence of the Hall field behavior on generator parameters such as magnetic field, insulator size and transverse current density. The theoretical work consisted of developing a computer program to model the processes leading up to both insulator and plasma initiated breakdown. DOE

N83-21247# Wisconsin Univ., Madison.
ASSESSMENT OF RESEARCH DIRECTIONS FOR HIGH-VOLTAGE DIRECT-CURRENT POWER SYSTEMS Final Report
W. F. Long Sep. 1982 57 p refs
(Contract DE-AC02-78ET-29185)
(DE83-001118; DOE/ET-29185/21) Avail: NTIS HC A04/MF A01

The identification of hardware developments and system applications which exemplify cost and operational advantages of integrated ac/dc power systems is discussed. The three principal tasks undertaken were: assessment of equipment developments; quantification of operational advantages; and interaction with system planners. The dissemination of information about high voltage direct current (HVDC) is a critical factor in fostering an understanding of this important adjunct to ac power transmission. DOE

N83-21248# Department of Energy, New York. Environmental Measurements Lab.
MINIATURE, LOW POWER CHARGE SENSITIVE PREAMPLIFIER
Sidney Watnick and Norman Latner Sep. 1982 10 p
(DE83-001425; DOE/EML-408) Avail: NTIS HC A02/MF A01

The results of the tests of a new miniature micro-power charge sensitive preamplifier for processing the pulses from silicon surface

barrier detectors are presented. This inexpensive preamplifier is compared with two other types which are not suitable for our laboratory requirements for portable instrumentation. DOE

N83-21249# Oak Ridge National Lab., Tenn.
EVALUATION OF POLYMERS FOR TRANSFORMER APPLICATIONS
H. E. McCoy, Jr. Dec. 1982 55 p refs
(Contract W-7405-eng-26)
(DE83-001717; ORNL/TM-8398) Avail: NTIS HC A04/MF A01

Aging studies were performed on polyethylene terephthalate, polycarbonate, polyparabanic acid, polyethersulfone, and polyimide at 70, 110, 135, and 1600C for times to 4000 h. Several types of tests were run on the aged materials to evaluate changes in mechanical and electrical properties. Polycarbonate showed evidence of degradation after aging at 1100C and higher temperatures, polyethylene terephthalate began to degrade at 1350C, and the other three polymers withstood 1600C without detectable deterioration. DOE

N83-21250# Smith, Hinchman and Gryllis Associates, Inc., Detroit, Mich.
A COMPUTER PROGRAM FOR ANALYZING THE ENERGY CONSUMPTION OF AUTOMATICALLY CONTROLLED LIGHTING SYSTEMS Final Report
Jan. 1982 98 p
(Contract W-7405-eng-48)
(DE82-007905; LBL-13894; EEB-L-82-02) Avail: NTIS HC A05/MF A01

A computer code to predict the performance of controlled lighting systems with respect to their energy saving capabilities is presented. The computer program provides a mathematical model from which comparisons of control schemes can be made on an economic basis only. The program does not calculate daylighting, but uses daylighting values as input. The program can analyze any of three power input versus light output relationships, continuous dimming with a linear response, continuous dimming with a nonlinear response, or discrete stepped response. Any of these options can be used with or without daylighting, making six distinct modes of control system operation. These relationships are described in detail. The major components of the program are discussed and examples are included to explain how to run the program. DOE

N83-21251# Sandia Labs., Albuquerque, N. Mex.
EVALUATION OF UNENCAPSULATED CERAMIC MONOLITHIC AND MOS THIN-FILM CAPACITORS (25 TO 300 C)
W. R. Nance Jan. 1982 31 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014359; SAND-82-0158) Avail: NTIS HC A03/MF A01

Several commercial monolithic ceramic and thin-film MOS chip capacitors were evaluated for use in high temperatures (300 C) geothermal instrumentation. Characteristics of the commonly used dielectric materials (NPO, X7R, BX) and temperature dependence of the insulation resistance are briefly discussed. Some ceramic capacitors with NPO dielectric materials had insulation resistances above 10 megohms at 300 C and less than 2% change in capacitance from 25 C to 300 C, while the X7R and BX dielectric materials exhibited insulation resistances below 10 megohm and changes in capacitance greater then 50%. The thin-film capacitors showed good stability at 300 C. However, during aging, bonds and bond pads presented a problem causing intermittently open circuits for some of the devices. DOE

N83-21252# Los Alamos Scientific Lab., N. Mex.
MAGNETIC SWITCHES AND CIRCUITS
W. C. Nunnally May 1982 43 p refs
(Contract W-7405-eng-36)
(DE82-017038; LA-8862-MS-Rev) Avail: NTIS HC A03/MF A01

Saturable inductors as switches in lumped element, magnetic pulse compression circuits is discussed and the characteristic use of each is defined. The geometric constraints and magnetic pulse compression circuits used in short pulse, low inductance systems are considered. The scaling of presaturation leakage currents, magnetic energy losses, and switching times with geometrical and material parameters are developed to aid in evaluating magnetic pulse compression systems in a particular application. A scheme for increasing the couping coefficient in saturable stripline transformers is proposed to enable their use in the short pulse, high voltage regime. DOE

N83-21253# McGraw-Edison Co., Franksville, Wis.
DISTRIBUTION VACUUM-ARC FAULT CURRENT LIMITER Final Report
L. M. Burrage, P. D. Pedrow, E. F. Veverka, D. R. Landergott, K. Nurmepuu, J. M. Driear, and W. R. Owens Feb. 1982 136 p refs Sponsored by DOE and EPRI
(DE82-903132; EPRI-EL-2266) Avail: NTIS HC A07/MF A01

The feasibility of using a vacuum arc as the basis for a distribution class fault current limiter was presented. The device has two modes of operation. One mode utilizes an externally applied axial magnetic field; the other uses the discharge's inherent magnetic field. A series of experiments yielded analytic models of the two modes of operation. It was found that for both cases, high arc voltages were generated by the conduction of current through an electron space charge region (sheath) near the anode. The vacuum arc with applied axial magnetic field was the most suitable mode for use as a commutating switch for a switched resistor fault current limiter. The test device used for the project could reliably commutate currents of 6.4 kA peak. The design of a 20 kA peak prototype commutating switch was completed but the prototype was not constructed. DOE

N83-21254# Oak Ridge National Lab., Tenn.
HIGH VOLTAGE RESEARCH (BREAKDOWN STRENGTHS OF GASEOUS AND LIQUID INSULATORS) AND ENVIRONMENTAL EFFECTS OF DIELECTRIC GASES Semiannual Report, 1 Apr. - 30 Sep. 1981
L. G. Christophorou, D. R. James, and R. Y. Pai Jan. 1982 153 p refs
(Contract W-7405-eng-26)
(DE82-011299; ORNL/TM-8158) Avail: NTIS HC A08/MF A01

Electron attachment on three perfluoroalkanes, two thioethers, n-C3F8, (CF3)2S, 1-C3F6, and 3,3,3C3F3H2 was studied. The attachment rates for CC13F were measured. The energies in dissociative electron attachment of C3F8, n-C4F10, and n-C6F14 were evaluated. Desirable characteristics and some candidate gas mixtures or gases used in diffuse discharge interrupting switches are discussed. The effect of electrode by sparking on observed breakdown voltages were studied. The observed variations of time to breakdown for various mixtures are discussed. Methods for reducing the harmful effects of small conducting particles in gas insulated apparatus were studied. The possible use of gases to form an insulating coating on offending particles, the effect of coating particles and ways to perform the coating were investigated. For sparking in SF6, SF4 was found to be a major product. The toxicity of gas mixtures before and after sparking was assessed. It is shown that effects of capacitance on the observed breakdown strengths of dielectric liquids increases capacitance lowers the breakdown voltage, however, less for external capacitance than for internal capacitance. DOE

N83-21255# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
FORCED VAPORIZATION COOLING OF HVDC THYRISTOR VALVES Final Report
R. P. Scaringe, F. W. Staub, G. M. Lazarek, S. H. Black, and N. Abuaf Oct. 1982 321 p refs Sponsored by EPRI
(EPRI Proj. 1207)
(DE83-900737; EPRI-EL-2710) Avail: NTIS HC A14/MF A01

The cooling of power dissipating devices by boiling Freon R-113 was investigated. Thermohydraulic instability questions were resolved, and it is shown that the maximum (critical) heat flux available using this coolant in a forced vaporization cooling mode provides sufficient margin for semiconductor device duty cycles.

Analytical predictive tools, experimental data, and empirical correlations are developed for design purposes. DOE

N83-21028*# Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
HIGH-FREQUENCY HIGH-VOLTAGE HIGH-POWER DC-TO-DC CONVERTERS
Thomas G. Wilson, Harry A. Owen, and Paul M. Wilson *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 167-173 refs Presented at US-Japan Cooperative Sci. Sem. on Anal. and Design in Power Electron. 1981, Kobe, Japan, Nov. 1981 (For primary document see N83-21006 11-20)
(Grant NsG-3157)
Avail: NTIS HC A09/MF A01

N83-21029# Crouzet Aerospace and Systems, Valence (France).
STATIC RELAY WITH A THERMAL PROTECTION
F. Fachinetti and C. Neveu *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 175-181 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

N83-21030# Fabrica Italiana Apparecchi Radio S.p.A., Milan (Italy).
THE 20 W R.F. HEXFET EPC DESIGN
P. Leoni *In* ESA 4th ESTEC Spacecraft Power-Conditioning Seminar Sep. 1982 p 183-186 refs (For primary document see N83-21006 11-20)
Avail: NTIS HC A09/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N83-21256 British Aerospace Aircraft Group, Preston (England). Fluid Mechanics Group.
THE CALCULATION OF FLOW AROUND COMPLEX AERODYNAMIC CONFIGURATIONS UNDERGOING SOLID BODY MOTION USING A SURFACE SINGULARITY METHOD
P. A. Mair and B. Hunt Nov. 1982 19 p refs
(BAE-A-744) Copyright. Avail. Issuing Activity

A method incorporated into the Warton MK 2 panel program system for validation, calculates the unsteady flow around complex aircraft configurations that are undergoing steady rigid body motion in the presence of an arbitrarily-moving steady airflow. Both translational and rotational rigid body motion can be modelled, and the set of valid applications includes stability derivatives; aircraft undergoing fixed rates of roll, pitch or yaw; compressor blades rotating inside a stationary duct; helicopter rotor blades; and any other motion in which the resultant flow appears steady relative to the moving configuration. A.R.H.

N83-21257# British Library Lending Div., Boston Spa (England).
CALCULATION OF TEMPERATURE REGIME OF HETEROGENEOUS PLATE HEATED BY RADIATION
Yu. V. Vidin 13 Dec. 1982 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Metall. (USSR), v. 11, 1981 p 136-139
(BLL-M-26842-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

An approximate analytical method is proposed for finding the temperature field in a heterogeneous body, particularly a plate consisting of several layers of differing properties, being heated by radiant heat and having a moderate thermal massiveness. Results obtained are considered in terms of accuracy and are compared with those obtained by a numerical method. The calculation expressions used in the proposed method are convenient for engineering practice and give final results of sufficient accuracy. Author

N83-21258# Centre National d'Etudes Spatiales, Toulouse (France). Centre Spatial.
MATHEMATICAL MODEL OF A LIQUID FILLED SATELLITE TANK [MODELE MATHEMATIQUE D'UN RESERVOIR DE SATELLITE AVEC LIQUIDE]
Alain Girard and Michel Bach Jun. 1982 31 p refs In FRENCH; ENGLISH summary
(CNES-NT-104) Avail: NTIS HC A03/MF A01

The studies performed to obtain a condensed but representative mathematical model of a liquid filled tank for the French satellite SPOT are described. Sloshing modes were analyzed using software for liquid filled axisymmetric tanks. Determination of stiffness between tank connections and of hydroelastic modes up to, at least, 100 Hz required a three dimensional finite element model using the NASTRAN software, condensed and correlated with test results. The study shows that the connecting flange has a dominant effect on the tank hydroelastic behavior. A.R.H.

N83-21259# Delft Hydraulics Lab. (Netherlands). De Voorst Lab.
VALUE OF REFINED TURBULENCE MODELING FOR THE FLOW OVER A TRENCH
B. J. Alfrink Jun. 1982 12 p refs Presented at Intern. Symp. on Refined Modeling of Flows, Paris, 7-10 Sep. 1982
(Publ-268) Avail: NTIS HC A02/MF A01

Steady recirculating flow in a steep-sided trench is examined using a mathematical model based on the full Reynolds equations. Turbulence closure is compared for standard kappa-epsilon and mixing length modelling. The sensitivity of the former model for the various constants is denoted. Author (ESA)

N83-21260*# Kent State Univ., Ohio.
AN EXPERIMENTAL STUDY OF ADSORPTION INTERFERENCE IN BINARY MIXTURES FLOWING THROUGH ACTIVATED CARBON
R. Madey and P. J. Photinos [1983] 11 p refs
(Grant NsG-2013)
(NASA-CR-170116; NAS 1.26:170116) Avail: NTIS HC A02/MF A01 CSCL 20D

The isothermal transmission through activated carbon adsorber beds at 25 C of acetaldehyde-propane and acetylene-ethane mixtures in a helium carrier gas was measured. The inlet concentration of each component was in the range between 10 ppm and 500 ppm. The constant inlet volumetric flow rate was controlled at 200 cc (STP)/min in the acetaldehyde-propane experiments and at 50 cc (STP)/min in the acetaldehyde-ethane experiments. Comparison of experimental results with the corresponding single-component experiments under similar conditions reveals interference phenomena between the components of the mixtures as evidenced by changes in both the adsorption capacity and the dispersion number. Propane was found to displace acetaldehyde from the adsorbed state. The outlet concentration profiles of propane in the binary mixtures tend to become more diffuse than the corresponding concentration profiles of the one-component experiments. Similar features were observed with mixtures of acetylene and ethane; however, the displacement of acetylene by ethane is less pronounced. A.R.H.

N83-21261# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
PREDICTIONS OF THE STRUCTURE OF TURBULENT, PARTICLE-LADEN, ROUND JETS
J.-S. Shuen, L.-D. Chen, and G. M. Faeth Jun. 1982 36 p refs Original document was announced as A83-16498
Avail: NTIS HC A03/MF A01

Models of gas and particle motion in turbulent, particle-laden, round jets were evaluated using existing measurements of flow structure. Three models were considered: (1) a locally homogeneous flow model, where velocities and turbulent mixing properties of both phases were assumed to be equal; (2) a deterministic

separated flow model, where interphase slip was considered but effects of turbulent dispersion were ignored; and (3) a stochastic separated flow model where effects of interphase slip and turbulent dispersion were considered using random sampling techniques. In all three cases, mean and turbulent properties of the continuous phase were found with a well-calibrated k-epsilon model. The locally homogeneous flow and deterministic separated flow models over- and underestimated particle spread and flow development rates, respectively. The stochastic separated flow model, however, yielded satisfactory predictions of flow structure - except at the high particle loadings. Uncertainties in initial conditions for the measurements and possible effects of turbulence modulation by the particles are proposed as the reason for these errors. Author (IAA)

N83-21262*# National Aeronautics and Space Administration, Washington, D. C.
DUAL EXPOSURE INTERFEROMETRY
G. Smeets and A. George Dec. 1982 20 p refs Transl. into ENGLISH of "Doppelbelichtungs-Interferometrie" rept. ISL-39-72 Inst. Franco-Allemand de Recherches, St. Louis, France, 4 Dec. 1972 p 1-22 Original language document was announced as N74-10459 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77002; NAS 1.15:77002) Avail: NTIS HC A02/MF A01 CSCL 20D

The application of dual exposure differential interferometry to gas dynamics and flow visualization is discussed. A differential interferometer with Wallaston prisms can produce two complementary interference fringe systems, depending on the polarization of the incident light. If these two systems are superimposed on a film, with one exposure during a phenomenon, the other before or after, the phenomenon will appear on a uniform background. By regulating the interferometer to infinite fringe distance, a resolution limit of approximately lambda/500 can be obtained in the quantitative analysis of weak phase objects. This method was successfully applied to gas dynamic investigations. Author

N83-21263*# National Aeronautics and Space Administration, Washington, D. C.
VORTEX MOTION BEHIND A CIRCULAR CYLINDER
Ludwig Foeppl Jan. 1983 18 p refs Transl. into ENGLISH from "Wirbelbewegung Hinter Einem Kreiszylinder" Munich, Akad. der Wissenschaften, 1913 p 1-18 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77015; NAS 1.15:77015) Avail: NTIS HC A02/MF A01 CSCL 20D

Vortex motion behind a circular cylinder moving through water is discussed. It is shown that a pair of vortices form behind a moving cylinder and that their centers will move along a predictable curve. This curve represents an equilibrium condition which, however, is subject to perturbation. The stability of the vortex pair is investigated. Movement of the vortex pair away from the cylinder is calculated as an explanation of the resistance of the cylinder. Finally, the principles elaborated are applied to the flow around a flat plate. Author

N83-21264*# National Aeronautics and Space Administration, Washington, D. C.
TURBULENT BOUNDARY LAYER AROUND A GROUP OF OBSTACLES IN THE DIRECTION OF FLOW
I. Nakamura, K. Miyata, Y. Yoshiya, and R. Nakahama Jan. 1983 21 p refs Transl. into ENGLISH from Trans. Japan Soc. Mech. Engr. (Japan), v. 45, no. 400, 1979 p 1816-1824 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77016; NAS 1.15:77016) Avail: NTIS HC A02/MF A01 CSCL 20D

Results of an investigation of a boundary layer in a turbulent flow on the surface of a wall having a group of obstacles on the path of flow are presented with regard to the mean velocity field, velocity distribution of the two dimensional flow, wall surface shear stresses and Reynolds stresses measured in a downstream cross section where an interference of boundary layers takes place in a flow around adjacent obstacles arranged on the path of flow. Author

N83-21265# British Library Lending Div., Boston Spa (England).
DETERMINATION OF THE HEAT CONDUCTIVITY OF HOT GASES FROM THE TEMPERATURE BOUNDARY LAYER IN THE SHOCK TUBE
G. Smeets 1982 13 p refs Transl. into ENGLISH from Z. Naturforsch. (West Germany), v. 20a, 1965 p 683-689
(BLL-T5948/BG/LRS/LRST570/82) Avail: British Library Lending Div., Boston Spa, Engl.

A theory is developed of the pure temperature boundary layer, as is formed after the reflection of the shock wave at the closed end of a shock tube. Then the interference figure is calculated, which occurs when one observes the temperature boundary layer in the differential interferometer. S.L.

N83-21266# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
SEPARATED FLOWS IN TURBOMACHINERY COMPONENTS, VOLUME 1
1981 223 p refs Lecture held in Rhode-Saint-Genese, Belgium, 12-16 Jan. 1981 2 Vol.
(VKI-LS-1981-1-Vol-1) Avail: NTIS HC A10/MF A01

Recent fundamental and practical research developments concerning the understanding of separated flows are presented and related to the design of turbomachinery components. Experimental results and prediction techniques are discussed for separating turbulent boundary layers, recirculating flows, and reattaching turbulent boundary layers. The following topics were treated in detail: experimental techniques for separated flows; physical features of recirculating flows, separating and reattaching turbulent shear flows; prediction of separating turbulent shear flows and recirculating flows; effects of wall curvature, free stream turbulence and rotation on boundary layers and boundary layer separation; LeFoll's calculation method; and flow in diffusers and rotating diffuser passages. For individual titles, see N83-21267 through N83-21275.

N83-21267# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
EXPERIMENTAL TECHNIQUES FOR SEPARATED FLOWS
Roger L. Simpson *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 35 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

A review of recent advances in experimental techniques for separated flows is given. The fact that in many separated flov cases there is flow reversal requires that the directional sensitivit of transducers be accounted for. Hot-wire and hot-film anemometry pulsed-wire anemometry, and laser anemometry velocity measuring techniques that account for this changing flow direction are discussed. Advances in static pressure measurement and surface hot-film measurement technology are noted. Application of holography to compressible separated flows is briefly discussed as are recent advances in signal processing capabilities. Author

N83-21268# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
FEATURES OF SEPARATING AND REATTACHING TURBULENT SHEAR FLOWS
Roger L. Simpson *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 34 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

Features of separating and reattaching turbulent shear flows are discussed. Incompressible cases where the mean flow is largely two dimensional are discussed. Three dimensional flow, compressibility, and unsteady effects are discussed. R.J.F.

N83-21269# Southern Methodist Univ., Dallas, Tex. Dept. of Civil and Mechanical Engineering.
PREDICTION METHODS FOR SEPARATED TURBULENT SHEAR FLOWS
Roger L. Simpson *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 12 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

The physical concepts and approaches that are contained in a representative sample of turbulent shear flow prediction methods for two dimensional adverse-pressure gradient induced separation, bluff body separation, and three dimensional separation are discussed. Integral and differential methods are discussed. R.J.F.

N83-21270# Karlsruhe Univ. (West Germany). Sonderforschungsbereich.
EXPERIMENTAL METHODS IN SEPARATED FLOWS
Cameron D. Tropea *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 14 p (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

Experimental methods in separated flows are discussed. It is concluded that: flow visualization is useful as an initial study of flow distribution, but that it has limited quantitative value; the laser doppler anemometer is well suited for measuring velocities in separated flows and should be used where possible; frequency shifting is a necessity in separated flows; and accurate measurements of reattachment length are possible with the laser Doppler anemometer. R.J.F.

N83-21271# Karlsruhe Univ. (West Germany). Sonderforschungsbereich.
THE BACKWARD-FACING STEP FLOW
Cameron D. Tropea *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 24 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

The backward-facing step flow is seem to be a complex interaction of a boundary layer and a constricted shear layer under the influence of an adverse pressure gradient, streamline curvature, and flow recirculation. Using a parametric description of the flow, several dependencies were experimentally established. R.J.F.

N83-21272# Manchester Univ. (England). Dept. of Mechanical Engineering.
CALCULATION OF RECIRCULATING FLOWS WITH VARIOUS DISCRETIZATION SCHEMES AND TURBULENCE MODEL VARIANTS
M. A. Leschziner *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 29 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

The identification and correction of errors arising in the computation of steady recirculating flows from the use of upwind discretization for convection and the Kappa approximates epsilon model of turbulence are discussed. This combination is currently the most frequently employed. The performance of two alternative discretization methods for convection is examined and compared to that of the upwind formulation for a number of model problems. All schemes and three variants of the Kappa approximates epsilon model, two of which account for preferential influence of secondary strain rates, are applied to the computation of a plane twin parallel jet and an annular jet. R.J.F.

N83-21273# Kyushu Univ., Fukuoka (Japan). Research Inst. of Industrial Science.
ROTATING STALL AND STALLING LIMIT OF VANELESS DIFFUSERS
Y. Senoo *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 19 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

Criteria for rotating stall and stalling of vaneless diffusers are posturated. The critical conditions for rotating stall are calculated for many cases using the criteria, and the results are compared with experimental data. Criteria for diffuser stalling is not quantitatively examined because of lack of experimental data. However, the results of theoretical calculation and the criteria suggest that rotating stall will not be induced in wide diffusers and short diffusers. The details of mechanism of rotating stall and of diffuser stalling are complicated and they are not well known. Furthermore the real flow in vaneless diffuser is not axisymmetric due to the scroll or collector at the exit and due to the impeller at the inlet. Because of the complicated nature of real flow, the details of flow in the diffuser may be different from one test case to another test case in the literature even when the vaneless diffusers are geometrically similar. R.J.F.

N83-21274# Kyushu Univ., Fukuoka (Japan). Research Inst. of Industrial Science.
FLOW IN VANELESS DIFFUSERS OF TURBOMACHINERY
Y. Senoo *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 32 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

Simple models are proposed for flow in vaneless diffusers. Analytical results are compared with experimental data to prove the validity of the models. Special attention is given to three dimensional flow separation which may be closely related to flow in the diffuser. R.J.F.

N83-21275# Kyushu Univ., Fukuoka (Japan). Research Inst. of Industrial Science.
FLOW IN DIFFUSERS
Y. Senoo *In* Von Karman Inst. for Fluid Dynamics Separated Flows in Turbomachinery Components, Vol. 1 1981 21 p refs (For primary document see N83-21266 11-34)
Avail: NTIS HC A10/MF A01

The flow behavior in simple diffusers is treated from a view-point of flow stability, and an important parameter to be included for internal flow analysis is proposed. Thereafter, the feature of the new parameter at the critical condition of diffuser stall is examined by comparing many experimental data in the literature with prediction based on a conventional boundary layer theory. As a result, the role of the parameter for flow separation is clarified and the parameter is nicely incorporated in a conventional boundary layer calculation method for internal flow. Furthermore, the modified theory is applied to a few cases of decelerating flow, and the predicted separation points and pressure distribution along the wall are compared with experimental data. R.J.F.

N83-21276# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
NON-NEWTONIAN FLOWS
1981 403 p refs Lecture held in Rhode-Saint-Genese, Belgium, 4-8 May 1981
(VKI-LS-1981-6) Avail: NTIS HC A18/MF A01

The present status of the field of non-Newtonian fluid dynamics is summarized. Emphasis is placed on those parts of the subject that are useful in polymer processing, technology of lubricants and other industrial applications. Examples of a number of simple analytical solutions to flow and heat transfer problems are given to illustrate the use of the basic equation of fluid dynamics. Flow visualization methods and laser Doppler velocimetry techniques are used to solve some industrial problems. Two special topics are presented: drag-reducing fluids and flows with suspensions. For individual titles, see N83-21277 through N83-21284.

N83-21277# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
AN INTRODUCTION TO NON-NEWTONIAN FLUID MECHANICS
R. Byron Bird *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 57 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

The basic equations of fluid dynamics are discussed and the need for constitutive equations (for rheological equations of state) that are more complicated than that for Newtonian fluids. Some of the experiments are discussed which prove conclusively that polymeric liquids are non-Newtonian. B.W.

N83-21278# University Coll. of Wales, Aberystwyth. Dept. of Applied Mathematics.
EXPERIMENTAL AND THEORETICAL ASPECTS OF NON-NEWTONIAN FLOWS
K. Walters *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 13 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

In non-Newtonian fluid mechanics, the basic problem may be stated as follows: given the availability of some simple (usually rheometrical) data for a test fluid, can one predict the behavior of that fluid in a more complex flow? This exercise involves the construction of suitable rheological equations of state; the solution of these, taken together with the familar equations of motion and continuity for some complex flow; and hopefully the comparison of the theoretical results with experimental data. Emphasis is placed on materials with memory (i.e., non-Newtonian elastic liquid) and with flow problems with rather complex geometries; so that numerical methods of solution are indispensable. B.W.

N83-21279# Universite Catholique de Louvain (Belgium).
FINITE ELEMENTS FOR SOLVING NON-NEWTONIAN FLOW
M. J. Crochet *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 69 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

Available finite element techniques for solving non-Newtonian flow problems are solved. The basic techniques used for solving partial differential and ordinary differential equations are discussed. The flow of viscoelastic fluids is also considered. B.W.

N83-21280# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
LASER DOPPLER VELOCIMETRY AND NON-NEWTONIAN FLOWS
M. L. Riethmuller *In its* Non-Newtonian Flows 1981 29 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

Laser Doppler velocimetry is applied to the study of non-Newtonian flow. This technique has proven to be the answer to a large number of problems. Its unique capability of non-intrusivity is one of its main advantages. Another interesting feature is its ability to cope with extremely low velocities. B.W.

N83-21281# Dortmund Univ. (West Germany). Abteilung Chemietechnik.
SOME RESULTS IN SUSPENSION RHEOLOGY
H. Giesekus *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 23 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

Some aspects of suspension rheology in Newtonian fluids are discussed. Spherical and non-spherical suspending agents are described. Effects specifically occurring in suspensions with viscoelastic fluid phase are considered. B.W.

N83-21282# Dortmund Univ. (West Germany). Abteilung Chemietechnik.
STRUCTURE OF TURBULENCE IN DRAG REDUCING FLOWS
H. Giesekus *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 36 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

The structure of turbulence in drag reducing flows is investigated. Turbulence is not fully understood in Newtonian flow. Arguments are put forward supporting the fact that viscoelastic properties yield the real cause for the drag reduction effect. Results indicate that in particular, the strong increase of extensional viscosity observed even in dilute solutions seems to play the most important part. B.W.

N83-21283# Monash Univ., Clayton (Australia). Dept. of Chemical Engineering.
EXPERIMENTAL STUDY OF ELASTIC EFFECTS IN COMPLEX FLOWS
D. V. Boger *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 60 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

The behavior of viscoelastic fluids in complex flows is analyzed. Described in these lectures is the development of non-shear-thinning elastic fluids and their use to isolate and observe elastic effects in complex flows. B.W.

N83-21284# Technion - Israel Inst. of Tech., Haifa.
STRATEGY OF THE DEVELOPMENT AND DESIGN OF POLYMER PROCESSING OPERATION
Z. Tadmor *In* Von Karman Inst. for Fluid Dynamics Non-Newtonian Flows 1981 116 p refs (For primary document see N83-21276 11-34)
Avail: NTIS HC A18/MF A01

A brief survey of polymer processing operations is presented. An analysis of the processing operations is given in terms of the elementary steps and shaping steps which reveal the fundamental mechanisms. An approach to synthesis or design of machinery is introduced. Finally, the simple screw extruder is discussed in detail and the principle of operation and design considerations of the novel disk pack processor are presented. B.W.

N83-21285# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Abt. Turbulenzforschung.
AUTOMATICALLY EQUALIZING FLUID MANOMETER COMBINED WITH A COMPUTER
Eberhard Froebel Oct. 1981 25 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-811)
(DFVLR-Mitt-82-15) Avail: NTIS HC A02/MF A01

A set of equations, developed for the state variables of moist air, will enable flow velocity to be determined from pressure-tube measurements with increased accuracy. Conditions for this development were assumed to be those that would occur, for example, during measurements in wind tunnels. The equations were set up so that a microprocessor (also described) can automatically acquire measured values of the state variables, compute the velocity, and output the results in either analog or digital form. This new technique will significantly enhance the capabilities of a previously published measuring system for differential pressure. Author (ESA)

N83-21286# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A STUDY OF LIQUID JETS Final Report
Guenter Klingenberg (Ernst-Mach-Inst. Abteilung fuer Ballistile), John D. Knapton, and Kenton E. Travis Oct. 1982 84 p refs (DA Proj. 1L1-61102 AH-43)
(AD-A123067; AD-F300098; ARBRL-MR-03203) Avail: NTIS HC A05/MF A01 CSCL 07/4

Various correlations were examined that were used for predicting mean droplet sizes generated by a single fluid jet. The correlation was compared with semiquantitative data obtained from spark photographs and from a particle sizing interferometer. Jet properties were investigated for three types of fluids, i.e., water, Hexane, and a moderately energetic liquid monopropellant (LP) used in gun applications. The photographic data are only suitable for a semiquantitative analysis due to severe diffraction problems. Some preliminary low velocity droplet data were obtained with the particle sizing interferometer. GRA

N83-21287# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
A UNIFIED MODEL FOR THE EVOLUTION OF NONLINEAR WATER WAVES Interim Report
J. M. Witting 30 Dec. 1982 69 p refs
(AD-A122822; NRL-MR-5001) Avail: NTIS HC A04/MF A01 CSCL 08/3

Details of a new model of water waves are given that describe wave propagation over long distances accurately, at low cost, and for a wide variety of physical situations. The analysis and numerical methods selected for computer solution are given in some detail. The model uses exact prognostic equations, and a high order expansion to relate variables at each time step. The accuracy of the model is demonstrated most completely for solitary wave propagation, where model results are compared to exact results. It is found that the model results are much more accurate for high solitary waves than are earlier, Boussinesq-type theories, and give good results for waves so high that they are almost breaking. The capability of the model to treat a variety of situations is demonstrated for colliding solitary waves, nonlinear dispersive wave trains, waves in channels of varying breadth, and undular bores. Formally, the model incorporates nonlinear long wave theory exactly, incorporates enough dispersion to describe linear waves with fourth-order precision, so that both shallow water waves and deep water waves are included, and describes accurately waves for which dispersive and nonlinear effects are both important. Author

N83-21288# Michigan State Univ., East Lansing. Turbulence Structure Lab.
COHERENT STRUCTURES IN TURBULENT BOUNDARY LAYERS Final Report, 1 May 1977 - 31 Dec. 1981
R. E. Falco 30 Nov. 1982 34 p refs
(Contract N00014-77-C-D348)
(AD-A122581; TSL-82-2) Avail: NTIS HC A03/MF A01 CSCL 20/4

Experimental investigations to determine the characteristics of the important coherent motions in turbulent boundary layers have been performed. Using simultaneous flow visualization and hot-wire anemometry, all motions have been detected and simultaneously quantified. Two coherent motions, one in the outer region and one in the wall region are important in the Reynolds number range R0 less than 4000. The important outer region eddy is a vortex ring like microscale eddy. Author (GRA)

N83-21289# Michigan State Univ., East Lansing. Turbulence Structure Lab.
AN EXPERIMENTAL STUDY OF TURBULENCE PRODUCTION MECHANISMS IN BOUNDARY LAYER FLOWS Final Report
R. E. Falco Aug. 1982 31 p refs
(Grant AF-AFOSR-3703-78)
(AD-A121716; TSL-82-1; AFOSR-82-0986TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

The major goal of this research has been to identify the mechanisms responsible for turbulence production near smooth walls. Although many dynamical features of the turbulence production process have been previously identified, and many models proposed to explain how these features came to be, the reasons for their existence, and for their evolution into turbulent eruptions are stil not satisfactorily understood. The coherence associated with the production of turbulence near a wall is greater than anticipated before this investigation began. It is clear that many aspects of the physics can be modelled by the vortex ring/wall interaction, however, it appears that somewhat less stringent conditions can also initiate new production. Furthermore, the same physics appears to govern production for Reynolds numbers up to the onset of the law of the wake (which signals the onset of high Reynolds number asymptotic behavior). However, further investigation is required to determine which details of the interactions are necessary and which are sufficient, before attempts at logically modifying the production rate can be made. GRA

N83-21290# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
UNDERWATER SHOCK ANALYSIS OF A MISSILE LAUNCH TUBE Final Report, Mar. - Oct. 1981
Kenneth C. Kiddy 20 May 1982 39 p refs
(AD-A122288; AD-F500102; NSWC/TR-82-94) Avail: NTIS HC A03/MF A01 CSCL 16/1

This report documents the results of a non-linear, elastic-plastic, structural response analysis of a missile launch tube to underwater shock. The analysis was performed with the structural response code USA-STAGS. This code employs the finite element method for the structure and the Doubly Asymptotic Approximation (DAA) for the fluid-structure interaction. This analysis was performed in support of a General Dynamics/Electric Boat Division design development for an upcoming shock test to be conducted by the Navy. This report is intended to document results to date in this support effort. GRA

N83-21291# Mississippi State Univ., Mississippi State. Dept. of Aerophysics and Aerospace Engineering.
THE GENERATION OF 3-DIMENSIONAL BODY-FITTED COORDINATE SYSTEMS FOR VISCOUS FLOW PROBLEMS Interim Report, 1 May 1981 - 30 Apr. 1982
Z. U. A. Warsi, C. W. Mastin, and J. F. Thompson Jul. 1982 55 p refs
(Grant AF-AFOSR-0185-80; AF Proj. 2304)
(AD-A122760; AFOSR-81-0942TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

The proposed set of equations which generate a series of surfaces between a given inner and outer body, have been programed on CRAY-1. An extensive program testing has been carried out to make the program usable for general body shapes. For example, two methods have been developed to establish the correspondence between the points of the inner and outer surfaces, a method has been developed to find the first partial derivative of x, y, z with respect to the coordinate along the surface. All these methods are based on sound mathematical basis and have not been chosen arbitrarily. Work has been started on complicated multibody configurations, such as the wing-body combination. Here the interfacing of coordinates having sufficient derivative smoothness is the most important problem. In the period of this report, a thorough analysis on all sorts of mathematical models for coordinate generation has been completed. This analysis uncovers those differential relations which must invariably be satisfied by the metric coefficients no matter which method is used to generate the coordinates. The final computational code to be developed in the current year of effort is expected to reflect all these achievements for practical utilization. GRA

N83-21292# Universal Energy Systems, Inc., Dayton, Ohio.
MULTIDUCTED INLET COMBUSTOR RESEARCH AND DEVELOPMENT Interim Technical Report, 31 Aug. 1981 - 31 Aug. 1982
Gary D. Streby Wright-Patterson AFB, Ohio AFWAL Oct. 1982 73 p refs
(F33615-82-C-2074; AF Proj. 2308)
(AD-A122776; AFWAL-TR-82-2101) Avail: NTIS HC A04/MF A01 CSCL 21/2

Preliminary flow visualization studies and residence time testing has been conducted of a multi-ducted inlet combustor configuration at the Water Tunnel test rig facility of the Ramjet Technology Branch AFWAL/PORT Wright-Patterson AFB, Ohio. Tests were conducted on a 45 degree inlet configuration for combustor dome plate positions of 0, 1, 2, 3, 4, 5, 6, 7 and 8 inches forward of the inlet ducts. Tests were conducted at water flow rates of 150 to 500 gallons per minute in 50 gallon per minute increments. The inlet duct Reynolds number per foot range was from 0.62 to 2.06 million per foot. This initial test program was conducted after the completion of several facility improvements and hardware modifications. In conjunction with the research and development effort, support has also been provided to the Cold Flow Channel and the Burner Thrust Stand test rigs of the Ramjet Technology Branch AFWAL/PORT. A literature survey on related

technical areas has been conducted and work has been initiated on math modeling efforts. Author (GRA)

N83-21293# VSE Corp., Oxnard, Calif.
SAFETY AND HUMAN FACTORS ENGINEERING ANALYSIS. HEAT RECOVERY INCINERATOR INSTALLATION Final Report
Fort Hueneme, Calif. Naval Civil Engineering Lab. Sep. 1982 35 p
(Contract N00123-82-C-0149; Y0817006)
(AD-A122638; NCEL-CR-82.033) Avail: NTIS HC A03/MF A01 CSCL 13/1

This report contains a safety and human factors analysis of the Navy's heat recovery incinerator (HRI) systems. These requirements were based on current military standards and an evaluation of the HRI's at NAS, Jacksonville and NS, Mayport, Fl. The data collected were used to develop preliminary design criteria for future HRIs. The safety analysis lists specific areas where problems can occur and what should be done to prevent injury to plant personnel. The human factors design criteria section lists steps that can be taken to improve personnel and plant operating efficiency. Finally, specific problems that are occurring at NAS, Jacksonville and NS, Mayport are given. Author (GRA)

N83-21294# Rochester Univ., N. Y.
BEHAVIOR OF MOIST, BUOYANT, TURBULENT PLUMES FROM ISOLATED SOURCES OF MOISTURE AND HEAT
Francois Pin and John E. Molyneux Nov. 1982 166 p refs
(Contract W-7405-eng-26)
(DE83-003388; ORNL/TM-8358) Avail: NTIS HC A08/MF A01

A set of equations which describe the behavior of atmospheric plumes in which special attention is given to the modeling of the microphysical processes and the treatment of the turbulence are presented. An original numerical scheme for solving these equations is studied, and a FORTRAN IV computer code is discussed. Simulations using real atmospheric data are compared with onsite plume measurements. It is found that the model accurately predicts the flow characteristics of the plumes and the dispersal of water vapor in the most complex atmospheres. DOE

N83-21295# California Univ., Berkeley. Lawrence Berkeley Lab. Passive Research and Development Group.
CORRELATIONS FOR CONVECTIVE HEAT TRANSFER FROM ROOM SURFACES
Emmanuel Altmayer, Ashok Gadgil, Fred Bauman, and Ronald C. Kammerud Aug. 1982 36 p refs
(Contract DE-AC03-76SF-00098)
(DE83-001561; LBL-14893-Draft) Avail: NTIS HC A03/MF A01

The development of a simple, accurate, and highly generalized set of correlations for the surface convection coefficients in enclosures typical of rooms in buildings is reported. The technique used consisted of the use of a recently developed numerical analysis computer program which solves the Navier-Stokes equations in two or three dimensions to perform numerical experiments. The project examined only a few of the possible combinations of boundary conditions and it is indicated that simple and accurate correlations can be developed. The significance of surface convection coefficients in the building sciences and the current state of the art are outlined. The numerical analysis technique and the methodology used to develop the preliminary correlation are described. The results are presented and compared to the standard results using techniques. DOE

N83-21296# Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Technology Div.
CRITICAL FLOW OF NITROGEN AND WATER THROUGH A NOZZLE
Evelyn H. Stalzer and Albert D. Richards Oct. 1982 61 p refs
(Contract W-7405-eng-26)
(DE83-001699; ORNL/MIT-359) Avail: NTIS HC A04/MF A01

Critical flow of nitrogen-water mixtures through a nozzle positioned in a vertical pipe with upward flow was studied. The flow rates of nitrogen and water from 7370 cu m/s to 10840 cu m/s at STP (15.6 to 22.2 scfm) and 355 cu m/s to 505 cu m/s (5.63 to 8.01 gpm), respectively. A 0.49 cm (0.93 in.) exit diameter, stainless steel nozzle was fitted inside a stainless steel pipe 1.516 cm (0.597 in.) in ID. The upstream critical pressure increased with increasing flow rates of nitrogen and water. An iterative empirical correlation was developed to predict upstream and vena contracta critical pressures for given nitrogen and water flow rates, temperature, and nozzle area. Upper and lower bounds for the upstream critical pressure were predicted theoretically. The upper bound, derived assuming homogeneous equilibrium flow, overpredicted the experimental value at each run by 0.31 +- 0.04 MPa (45 +- 5.8 psia) DOE

N83-21297# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
AN EXPERIMENTAL AND THEORETICAL STUDY OF HEAT TRANSFER IN CONSTANT-VOLUME AND COMPRESSION-EXPANSION SYSTEMS INCLUDING THE EFFECTS OF FLAME PROPAGATION Ph.D. Thesis
Joan Brune Woodard Mar. 1982 151 p refs
(Contract DE-AC03-76SF-00098)
(DE82-012782; LBL-14097) Avail: NTIS HC A08/MF A01

Heat transfer phenomena are studied. First an analysis of an observed reversal in the direction of the wall heat flux is presented. Then, an experimental study is reported in which simultaneous wall heat flux, pressure, and flame propagation data are obtained. In particular, the interaction of the flame propagation and wall heat transfer is discussed. An analytical solution for the reversal in direction of the wall heat flux during compression and expansion is derived. The results are in good agreement with experimental measurements. Temperature profiles were calculated. From these temperature profiles and the analytical solution of the wall heat flux, a physical explanation for the heat transfer reversal is determined. Simultaneous measurements of pressure, wall temperature, wall heat flux, and flame location and shape were obtained for combustion in constant volume, expansion, and compression-expansion systems. DOE

N83-21298# West Virginia Univ., Morgantown. Dept. of Aerospace Engineering.
ANISOKINETIC SAMPLING OF PARTICULATE IN DUCT FLOWS
J. G. Svinos, R. A. Bajura, and A. Padhye Feb. 1982 112 p refs
(Contract DE-AM21-79MC-11284)
(DE82-012228; DOE/MC-11284/T13) Avail: NTIS HC A06/MF A01

A theoretical model was developed to predict the error in the particulate concentration measurements due to anisokinetic sampling of flowing aerosols. The model is developed for flows with a uniform velocity profile upstream from the sampling probe. The probe wall was assumed infinitely thin and the particles were assumed to be spherical and monodisperse. The predictions of the theoretical model were generally in good agreement with analytical and experimental data. By curve fitting the results of the theoretical model, a correlation was developed which permits the calculation of the concentration ratio for velocity ratios between 0.25 and 3.5 and Stokes numbers between 0.02 and 0.50. DOE

N83-21299# Los Alamos Scientific Lab., N. Mex.
STRUCTURAL PERFORMANCE OF HEPA FILTERS UNDER SIMULATED TORNADO CONDITIONS
H. L. Horak, W. S. Gregory, C. I. Ricketts (New Mexico State Univ.), and P. R. Smith (New Mexico State Univ.) Feb. 1982 105 p refs
(Contract W-7405-eng-36)
(DE82-013815; NUREG/CR-2565; LA-9197-MS) Avail: NTIS HC A06/MF A01

The response of high efficiency particulate air filters to simulated tornado conditions was determined. The data include the structural limits of the filters, their resistance at high flow rates, and the effects of filter design features and tornado parameters. Considering all the filters tested, the mean break

pressure or structural limit was found to be 2.35 pse (16.2 kPa). The maximum value was 2.87 psi (19.8 kPa), and the low value found was 1.31 psi (9.0 kPa). The type of failure was usually a medium break of the downstream filter fold. The types of filters that were evaluated were nuclear grade with design flow rates of 1000 cfm (0.472 cu m/s), standard separators, and folded medium design. The parameters evaluated that are characteristic of the filter included manufacturer, separator type, face-guards, pack tightness, and aerosol loading. Manufacturer and medium properties were found to have a large effect on the structural limits. DOE

N83-21300# Oak Ridge National Lab., Tenn.
THERMAL HYDRAULIC ANALYSIS OF THE ANNULAR FLOW HELIUM HEATER DESIGN
N. C. Chen and J. P. Sanders May 1982 31 p refs
(Contract W-7405-eng-26)
(DE82-014577; ORNL/TM-8228) Avail: NTIS HC A03/MF A01

Core support performance test (CSPT) by use of an existing facility, components flow test loop (CFTL), as part of the high temperature gas cooled reactor (HTGR) application program were conducted. A major objective of the CSPT is to study accelerated corrosion of the core graphite support structure in helium at reactor conditions. Concentration of impurities will be adjusted so that a 6 month test represents the 30 year reactor life. Thermal hydraulic and structural integrity of the graphite specimen, will be studied at high pressure of 7.24 MPa (1050 psi) and high temperature of 1000 deg C in a test vessel. To achieve the required high temperature at the test section, a heater bundle has to be specially designed and properly manufactured. Performance characteristics of the heater which were determined from an analysis based on this design are presented. DOE

N83-21301# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
STOCHASTIC COOLING
Joseph Bisognano and Christoph Leemann Mar. 1982 76 p refs Presented at the Summer School on High Energy Particle Accelerators, Batavia, Ill., 13 Jul. 1981
(Contract W-7405-eng-48)
(DE82-014472; LBL-14106; CONF-810774-5) Avail: NTIS HC A05/MF A01

Stochastic cooling is the damping of betratron oscillations and momentum spread of a particle beam by a feedback system. In its simplest form, a pickup electrode detects the transverse positions or momenta of particles in a storage ring, and the signal produced is amplified and applied downstream to a kicker. The time delay of the cable and electronics is designed to match the transit time of particles along the arc of the storage ring between the pickup and kicker so that an individual particle receives the amplified version of the signal it produced at the pick up. If there were only a single particle in the ring, it is obvious that betratron oscillations and momentum offset could be damped. However, in addition to its own signal, a particle receives signals from other beam particles. In the limit of a infinite number of particles, no damping could be achieved; although there is Liouville's theorem with constant density of the phase space fluid. DOE

N83-21302# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
WAVE ENERGY ABSORPTION FROM OSCILLATING WATER COLUMNS
Chiang C. Mei and Marc Henry Rolfes 1982 141 p refs
(Contract DE-AC02-77CH-00178)
(DE82-012748; DOE/ET-21062/1) Avail: NTIS HC A07/MF A01

The characteristics of the oscillating water column wave energy device are investigated under the assumptions of infinite water depth and excitation by harmonic, small amplitude waves. Expressions describing the amplitude of water motion inside the column, velocity and pressure at the turbine inlet, and energy absorption of the devices are presented. A vertical surface piercing hollow circular cylinder is examined whose air chamber area decays exponentially above the still water level. A power takeoff device is located a finite distance above the still water level where the energy absorption of the device is modeled linearly and/or quadratically with the air velocity at the turbine inlet. The problem of two identical interacting oscillating water column devices such as the one just described is also investigated. DOE

N83-21303# Pacific Northwest Lab., Richland, Wash.
ABSTRACTS OF THE SYMPOSIUM ON UNSATURATED FLOW AND TRANSPORT MODELING
Mar. 1982 22 p refs Symp. held at Seattle, Wash., 23 Mar. 1982
(Contract DE-AC06-76RL-01830)
(DE82-013578; PNL-SA-10325; CONF-820364-Absts) Avail: NTIS HC A02/MF A01

Abstract titles presented are: recent developments in modeling variably saturated flow and transport; unsaturated flow modeling as applied to field problems; coupled heat and moisture transport in unsaturated soils; influence of climatic parameters on movement of radionuclides in a multilayered saturated-unsaturated media; modeling water and solute transport in soil containing roots; simulation of consolidation in partially saturated soil materials; modeling of water and solute transport in unsaturated heterogeneous fields; fluid dynamics and mass transfer in variably saturated porous media; solute transport through soils; one dimensional analytical transport modeling; convective transport of ideal tracers in unsaturated soils; chemical transport in macropore mesopore media under partially saturated conditions; influence of the tension saturated zone on contaminant migration in shallow water regimes; influence of the spatial distribution of velocities in porous media on the form of solute transport; stochastic vs deterministic models for solute movement in the field; and stochastic analysis of flow and solute transport. DOE

N83-21304# Los Alamos Scientific Lab., N. Mex.
DIMENSIONLESS EQUATION OF STATE FOR CONDENSED MEDIA: NUMERICAL RESULTS FOR SHOCK HEATING AND FOR FLOW DEFLECTION BY AN OBLIQUE STATIONARY SHOCK
J. M. Walsh Sep. 1982 20 p refs
(Contract W-7405-eng-36)
(DE83-002308; LA-9516-MS) Avail: NTIS HC A02/MF A01

A dimensionless equation of state formulation causes the solutions to a few standard problems in shock hydrodynamics to be somewhat more general than usual. Calculated results are given for shock heating and for the important problem of flow deflection by an oblique shock. The results are useful on occasion because they can be applied without having to resort to extensive calculations for each application. DOE

N83-21305# Oak Ridge National Lab., Tenn. Instrumentation and Controls Div.
SURFACE HEAT TRANSFER IN A STIRRED BOILING-WATER BATH
R. M. Carroll and R. L. Shepard Nov. 1982 16 p ref
(Contract W-7405-eng-26)
(DE83-003189; ORNL/TM-8522) Avail: NTIS HC A02/MF A01

A platinum resistance thermometer element was used to measure both temperature and heat transfer conditions in a stirred boiling water bath. The average heat transfer was affected strongly by stirring but only slightly by the boiling rate. For both room temperature stirred baths and stirred boiling baths, there were fluctuations about the mean heat transfer rate. The magnitude of the fluctuations increased with stirring rate and fluctuations had periods of 1 to 2 s. It is concluded that stirred water baths, whether boiling or room temperature, are not reproducible heat transfer systems and thus measurements of the thermal response time of temperature sensors in the baths will contain errors unless the heat transfer rate of the bath is measured during the response tests. DOE

N83-21306# Solar Turbines International, San Diego, Calif.
CERAMIC HEAT EXCHANGER TECHNOLOGY DEVELOPMENT Final Report, Sep. 1980 - Mar. 1982
Michael E. Ward and Alan H. Campbell Nov. 1982 94 p refs

(Contract DE-AC01-80ET-13712)
(DE83-002563; DOE/ET-13712/T1; SR82-R-4898-30; DE-4989-E)
Avail: NTIS HC A05/MF A01

Technology for pressurized, high temperature, ceramic tube heat exchangers was established by materials evaluation, design, and fabrication studies followed by rig tests. Candidate ceramic materials were surveyed for strength, environmental stability with coal ash, and other design properties. Design and fabrication studies of joining methods were responsible for selection of the chosen heat exchanger configuration. A full length, 28 tube, 4.56 m ceramic tube heat exchanger with a 11.43 cm diameter ceramic header is successfully tested with a 1505OK (2250OF) outlet temperature at 689 kPa (100 psi). Hot side gas temperature during this test was 1643OK (2500OF). The module operated for approximately 125 hours. DOE

N83-21307# West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
CURRENT STATUS OF FLUIDIZATION ENGINEERING AND AREAS FOR FUTURE RESEARCH NEEDS
C. Y. Wen May 1982 130 p refs
(Grant NSF-81-SP-1150)
(PB83-107755; NSF/OIR-82003) Avail: NTIS HC A07/MF A01 CSCL 21B

The state-of-the-art of fluidization, particularly for design and scale-up of bed reactors, is reviewed. Particulate, bubbling, slugging, turbulent, and circulating fluidization are described and research needs in fluidization flow regimes are identified. Fluidized bed reactor models are examined and research needs are noted. Models are proposed for the heat transfer coefficients in fluidized beds and gas convective heat transfer, particle convective heat transfer, and radiative heat transfer are discussed. Three-phase fluidization and the phenomena and parameters important in the design of three-phase fluidized bed reactors are also analyzed including: bubble behavior, phase holds-ups, pressure drop, phase mixing, gas-liquid mass transfer, solid entrainment, and a flow regime map. The development of better instrumentation for studying conceptual and mechanistic pictures within fluidized beds is recommended. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N83-21308 Royal Signals and Radar Establishment, Malvern (England).
THE AXIS TEST BOX OPERATING GUIDE
A. L. Simcock Oct. 1982 35 p refs
(RSRE-3517; BR86136) Copyright. Avail: Issuing Activity

This memorandum is the operating guide for the microprocessor controlled test box built for Project AXIS. The operating guide is designed to be both a comprehensive step by step guide and also a 'quick reference' guide for the experienced user. Author

N83-21309 Royal Aircraft Establishment, Farnborough (England).
SOME TECHNIQUES IN ANALYTICAL OPTICAL MICROSCOPY
A. J. Christopher Jun. 1982 33 p refs
(RAE-TM-MAT-397; BR84947) Copyright. Avail: Issuing Activity

Facilities for analytical optical microscopy provide a useful addition to the range of techniques employed. The crucial part of the analysis of unknown samples is often the preliminary examination. For solid samples, optical microscopy is often the best approach to the preliminary examination because of the morphological details revealed: alternatively, microscopy is useful in confirming the presence of particular compounds suspected from results of other techniques. The microscopical facilities described are built around a Vickers M41 Photoplan microscope fitted for transmitted and incident light, polarized light, dispersion staining and camera optics. B.G.

N83-21310 Royal Aircraft Establishment, Farnborough (England).
IMAGE PROCESSING AND ANALYSIS TECHNIQUES FOR READING KINETHEODOLITE FILM SCALES
Ann M. Bagot Jun. 1982 30 p refs
(RAE-TR-82069; RAE-IT-179; BR85461) Copyright. Avail: Issuing Activity

This report describes a series of techniques for processing and analyzing images. Although developed for a specific purpose, namely the automatic reading of angular information on Askania kinetheodolite film, most of the techniques are quite general, and potentially applicable to a wide variety of problems. The processes described include real time binarisation of a television signal, production and analysis of projections to determine the positions of features of interest, and character recognition. Author

N83-21311* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MINIATURE SPECTRALLY SELECTIVE DOSIMETER Patent
Richard R. Adams, Ian O. MacConochie, and Bordie D. Poole, Jr., inventors (to NASA) Issued 8 Oct. 1980 7 p Filed 8, Oct. 1980 Supersedes N81-12388 (19-03, p 0346)
(NASA-Case-LAR-12469-1; US-Patent-4,372,680;
US-Patent-Appl-SN-195223; US-Patent-Class-356-51;
US-Patent-Class-250-338; US-Patent-Class-250-372;
US-Patent-Class-250-474.1) Avail: US Patent and Trademark Office CSCL 14B

A miniature spectrally selective dosimeter capable of measuring selected bandwidths of radiation exposure on small mobile areas is described. This is achieved by the combination of photovoltaic detectors, electrochemical integrators (E-cells) and filters in a small compact case which can be easily attached in close proximity to and substantially parallel to the surface being measured. In one embodiment two photovoltaic detectors, two E-cells, and three filters are packaged in a small case with attaching means consisting of a safety pin. In another embodiment, two detectors, one E-cell, three filters are packaged in a small case with attaching means consisting of a clip to clip over a side piece of an eye glass frame.
Official Gazette of the U.S. Patent and Trademark Office

N83-21312* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
COMPRESSION TEST APPARATUS Patent
George C. Shanks, inventor (to NASA) Issued 13 Feb. 1981 5 p Filed 13 Feb. 1981 Supersedes N81-24470 (19 - 15, p 2067)
(NASA-Case-MSC-18723-1; US-Patent-4,377,089;
US-Patent-Appl-SN-234223; US-Patent-Class-73-818) Avail: US Patent and Trademark Office CSCL 14B

An apparatus for compressive testing of a test specimen may comprise vertically spaced upper and lower platen members between which a test specimen may be placed. The platen members are supported by a fixed support assembly. A load indicator is interposed between the upper platen member and the support assembly for supporting the total weight of the upper platen member and any additional weight which may be placed on it. Operating means are provided for moving the lower platen member upwardly toward the upper platen member whereby an increasing portion of the total weight is transferred from the load indicator to the test specimen.
Official Gazette of the U.S. Patent and Trademark Office

N83-21313# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
DEVELOPMENT AND TESTING OF A PRECISION LEVELLING DEVICE FOR MARINE GRAVITY METERS Final Report, Mar. 1980
Wielant Gauthier, Peter Groz, Ulrich Harmann, Hans Scheurenb-

rand, and Tilman Spaeth Bonn Bundesministerium fuer Forschung und Technologie Jul. 1982 170 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-124; ISSN-0340-7608) Avail: NTIS HC A08/MF A01

An improved leveling device to increase the dynamic measuring accuracy of sea gravity meters was developed. With a 15 kg load a dynamic accuracy of the leveling device of 0,5 minutes was achieved and the measuring accuracy of the gravity measuring system was improved from + or - 0.6 mgal to + or - 0.2 mgal. It is shown that gravity measurements during turn maneuvers and made with a maximum error of only 1 mgal, by appropriate compensation of misaligning accelerations. The utilization of the so far not usable gravity profile curve portions is considered.
E.A.K.

N83-21314*# General Electric Co., Wilmington, Mass. Aircraft Instruments Dept.
HIGH ACCURACY FUEL FLOWMETER, PHASE 1 Final Report
Christopher Mayer, Len Rose, Alan Chan, Bock Chin, and William Gregory Mar. 1983 156 p refs
(Contract NAS3-22139)
(NASA-CR-167893; NAS 1.26:167893) Avail: NTIS HC A08/MF A01 CSCL 14B

Technology related to aircraft fuel mass - flowmeters was reviewed to determine what flowmeter types could provide 0.25%-of-point accuracy over a 50 to one range in flowrates. Three types were selected and were further analyzed to determine what problem areas prevented them from meeting the high accuracy requirement, and what the further development needs were for each. A dual-turbine volumetric flowmeter with densi-viscometer and microprocessor compensation was selected for its relative simplicity and fast response time. An angular momentum type with a motor-driven, spring-restrained turbine and viscosity shroud was selected for its direct mass-flow output. This concept also employed a turbine for fast response and a microcomputer for accurate viscosity compensation. The third concept employed a vortex precession volumetric flowmeter and was selected for its unobtrusive design. Like the turbine flowmeter, it uses a densi-viscometer and microprocessor for density correction and accurate viscosity compensation. Author

N83-21315*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ATMOSPHERIC SIMULATOR AND CALIBRATION SYSTEM FOR REMOTE SENSING RADIOMETERS
James A. Holland Mar. 1983 13 p refs
(NASA-TM-84607; L-15568; NAS 1.15:84607) Avail: NTIS HC A02/MF A01 CSCL 14B

A system for calibrating the MAPS (measurement of air pollution from satellites) instruments was developed. The design of the system provides a capability for simulating a broad range of radiant energy source temperatures and a broad range of atmospheric pressures, temperatures, and pollutant concentrations for a single slab atmosphere. The system design and the system operation are described. S.L.

N83-21316*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPARATUS AND METHOD FOR INSPECTING A BEARING BALL Patent Application
Benjamin F. Bankston, inventor (to NASA) Filed 9 Mar. 1983 14 p
(NASA-Case-MFS-25833-1; US-Patent-Appl-SN-473827) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus for inspecting the surface of a bearing ball is disclosed which includes a base having a high friction non-abrasive base scanning surface. A holding device includes a cone-shaped cup recess in which a ball element is received. Air is introduced through a passage to relieve friction between the wall of the recess and the ball element and facilitate rolling of the ball over the high friction base surface. The holding device is moved over the base scanning surface in a predetermined pattern such that the entire surface of the ball element is inspected by an eddy current probe which detects any surface defects. NASA

N83-21317# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
US ARMY TEST AND EVALUATION COMMAND TEST OPERATIONS PROCEDURE. TEMPERATURE-MEASURING DEVICES Final Report
30 Nov. 1982 14 p refs
(AD-A122177; TPO-1-1-058) Avail: NTIS HC A02/MF A01 CSCL 14/2

Various temperature measuring devices used in conducting tests of material subjected to a range of temperatures to ensure functioning in all environments are described. These devices are also used to measure the temperature of the environment itself.
GRA

N83-21318# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
AN EVALUATION OF METHODS FOR MEASURING SURFACE TEMPERATURE Final Report
Gunter Huebner and Curtis L. Gladen Oct. 1982 41 p refs
(DA Proj. 4A7-62719-AT-40)
(AD-A122790; WES/MP/EL-82-4) Avail: NTIS HC A03/MF A01 CSCL 14/2

In order to evaluate the effectiveness of infrared camouflage, surface temperatures of targets and backgrounds have to be measured. A variety of instruments are available to do this and have been used in previous field tests. Inconsistencies in the results from these experiments prompted the test reported herein. A simple asphalt target was instrumented with several types of thermometers to measure kinetic temperature and radiation temperature. Readings from radiation thermometers were found to depend on target emissivity, sky temperature, and spectral range of instrument. Measurements of kinetic temperature depended on surface contact of the probe and on the amount of surface disturbance. Any comparison between different temperature measurement techniques should take these influences into account. Author (GRA)

N83-21319# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
THE 60-GHZ GYROTRON DEVELOPMENT PROGRAM Quarterly Report, Apr. - Jun. 1982
J. F. Shively, L. J. Craig, S. J. Evans, K. L. Felch, L. J. Fox, G. Hu, H. R. Jory, and S. T. Spang Jun. 1982 50 p refs Prepared for ORNL, Tenn.
(Contract W-7405-eng-26)
(DE83-003398; ORNL/SUB-79/21453/12; QR-12) Avail: NTIS HC A03/MF A01

A microwave oscillator capable of producing 200 kW of CW power at 60 GHz was developed. A CW experimental tube, X-5, produced 100 kW of output power at 60 GHz. The experimental tube incorporated a thinner double disc output window to improve window bandwidth, and some modifications to the drift tunnel and cavity coupling were proven successful in earlier pulse tube tests. When the boiling problem in the waterload is solved, X-5 will produce even more output power. DOE

N83-21320# Oak Ridge Gaseous Diffusion Plant, Tenn. Barrier Technology Dept.
MICROCOMPUTER-BASED FLOWMETER FOR DETERMINING AVERAGE LIQUID-PHASE FLOW IN A TWO-PHASE FLUID Thesis - Tennessee Univ., Knoxville
J. C. Rowe Dec. 1982 105 p refs
(Contract W-7405-eng-26)
(DE83-003967; K/PS-5000) Avail: NTIS HC A06/MF A01

A microcomputer-based flowmeter was developed to meter the average liquid phase flow in a two-phase fluid, where the two phase fluid, where the two phases are liquid and gas. An experimental system was set up to test the flowmeter and to develop a mathematical model for the device. The resulting

experimental model fits the data with a prediction error of less than 0.2 percent of flow rate over the tested span of zero to five gallons per minute. A microcomputer performs all flow calculations using the model, and also control flowmeter functions and displays diagnostic information. DOE

N83-21321# Pacific Northwest Lab., Richland, Wash.
EVALUATION OF ACOUSTICAL HOLOGRAPHY FOR THE INSPECTION OF LIGHT WATER REACTOR WELD ASSEMBLIES
H. D. Collins and R. P. Gribble Jun. 1982 66 p refs
(Contract DE-AC06-76RL-01830)
(DE82-015601; PNL-4304) Avail: NTIS HC A04/MF A01

Acoustical holography techniques for characterization of the light water reactor weld surface signatures in the nuclear safeguards program were evaluated. The accurate characterization of weld surface irregularities and vertical deviations was achieved using acoustical holographic interferometric techniques. Preselected weld surfaces were inspected and the vertical deviations characterized by phase measurements or fringe densities in the image. Experimental results on Sandia samples verify depth deviation sensitivities of 0.11 microns to 0.16 microns. The two point interferogram technique is recommended for surveillance of the weld surface associated with fuel rod removal in the nuclear safeguard program. The use of this unique holographic signal processing provides essentially a fail safe method for surveillance of clandestine fuel rod removal. DOE

N83-21322# Hanford Engineering Development Lab., Richland, Wash.
2200 DEG C THERMOCOUPLES FOR NUCLEAR-REACTOR-FUEL CENTERLINE-TEMPERATURE MEASUREMENTS
C. P. Cannon 1982 8 p refs In FRENCH Presented at the 6th Symp. on Temp., Washington, D.C., 13-19 Mar. 1982
(Contract DE-AC06-76FF-02170)
(DE82-014186; CONF-820306-10; HEDL-SA-2639-FP) Avail: NTIS HC A02/MF A01

Thermocouples capable of operation at temperatures to 2200 C were fabricated to measure reactor fuel centerline temperatures in loss of fluid tests and severe fuel damage tests. The technology and commercial suppliers were developed for three basic thermocouple designs. Rhenium and Mo48%/Re are used as sheath materials and HfO2 and BeO are used as insulator materials. Laboratory qualification tests were performed including long term tests of up to 1000 hours at 2200 C on the Re/HfO2 design. The thermocouples are 1.57 mm O.D., 76 cm to 104 cm length and contain 0.25 mm O.D. W5%Re/W26%Re thermoelement wires. Thermocouples probes are spliced to stainless steel sheathed, compensating lead cables. Some of the thermocouple designs contain a small diameter ceramic to metal gas seal in the transition region between the thermocouples and the compensating lead cable. DOE

N83-21323# General Electric Co., Schenectady, N. Y. Research and Development Dept.
FAULT-DETECTION SENSORS FOR GAS INSULATED EQUIPMENT Final Report
J. K. Wittle, J. M. Houston, G. J. Carlson, W. D. Davis, A. M. Itani, J. G. Jewell, M. P. Perry, and T. H. Rautenberg Feb. 1982 222 p refs Sponsored by DOE and EPRI
(DE82-901840; EPRI-EL-2249) Avail: NTIS HC A10/MF A01

Three types of sensors were developed for detecting and locating faults or internal degradation in SF 6 insulated equipment: resistive thin film, optical, and magnetic. Each has at least one visual output indicator which is activated when a fault current of sufficient magnitude has occurred. The thin film sensor changes resistance when exposed to typical arced SF 6 byproducts. The optical sensor detects arc light using a phototransistor coupled to an optical fiber which penetrates the container. The magnetic sensor is a battery powered magnetometer which measures magnetic flux density outside the outer GIS conductor in the direction parallel (axial) to the conductors. B.G.

N83-21324# Atomic Energy of Canada Ltd., Chalk River (Ontario). Special Projects Div.
A NOVEL EDDY-CURRENT SURFACE PROBE
H. W. Ghent Oct. 1981 24 p refs
(DE82-903039; AECL-7518) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

An eddy current probe designed specifically for detecting shallow surface defects in nonmagnetic materials was developed. Surface defects less than 0.1 mm can be readily detected on rough surfaces using relatively low test frequencies. The probe design, characteristic lift-off and defect signals, and practical results are presented. DOE

N83-21325# Colorado Univ., Boulder. Dept. of Physics.
RECENT RESULTS FROM MAC
W. R. Ford, J. S. Marsh, A. L. Read, Jr., J. G. Smith, A. Marini, I. Peruzzi, M. Piccolo, F. Ronga, L. Baksay, H. R. Band et al May 1982 13 p refs Presented at the 17th Rencontre de Moriond Workshop on New Spectry., Les Arcs, France, 20-26 Mar. 1982 Prepared in cooperation with Comitato Nazionale per l'Energie Nucleare, Frascati, Italy, Northeastern Univ., Stanford Linear Accelerator Center, Utah Univ., Salt Lake City and Wisconsin Univ., Madison
(Contracts DE-AC03-76SF-00515; DE-AC02-76ER-02114; DE-AC02-76ER-00881; Grants NSF PHY-77-21210; NSF PHY-77-21297; NSF PHY-80-06504)
(DE82-016167; SLAC-PUB-2921; CONF-820371-4; COLO-HEP-33) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Some preliminary results from the MAC detector at PEP are presented. These include measurements of the angular distribution of gamma gamma, mu mu and tau tau final states, a determination of the tau lifetime, a measurement of R, and a presentation of the inclusive muon p/sub perpendicular/ distribution for hadronic events. DOE

N83-21326# California Univ., Berkeley. Lawrence Berkeley Lab.
IMAGING WITH A MULTIPLANE MULTIWIRE PROPORTIONAL CHAMBER USING HEAVY-ION BEAMS
W. T. Chu, J. R. Alonso, and C. A. Tobias 1982 7 p refs Presented at the Intern. Workshop on Phys. and Eng. in Med. Imaging, Pacific Grove, Calif., 15 Mar. 1982
(Contracts W-7405-eng-48; DE-AC03-76SF-00098; Grant NIH-CA15184)
(DE82-014474; LBL-14143) Avail: NTIS HC A02/MF A01

A 16 plane multiwire proportional chamber was developed to accurately map intensity profiles of heavy ion beams at the Bevalac. The imaging capability of the system was tested for reconstruction of 3 dimensional representation of a canine thorax region using heavy ion beams. DOE

N83-21327# Colorado Univ., Boulder.
THE MAC CALORIMETERS AND APPLICATIONS
W. T. Ford, J. S. Marsh, A. L. Read, J. G. Smith, A. Marini, I. Peruzzi, M. Piccolo, F. Ronga, K. Appert, L. Baksay et al Mar. 1982 7 p refs Presented at the SLAC Intern. Conf. on Instr. for Colliding Beams, Stanford, Calif., 17-23 Feb. 1982 Prepared in cooperation with Comitato Nazionale per l'Energie Nucleare, Frascati, Italy, Northeastern Univ., Stanford Linear Accelerator Center, Utah Univ., Salt Lake City and Wisconsin Univ., Madison
(Contracts DE-AC03-76SF-00515; DE-AC02-76ER-02114; DE-AC02-76ER-00881; Grants NSF PHY-77-21210; NSF PHY-77-21297; NSF PHY-5-39485)
(DE82-016170; SLAC-PUB-2894; CONF-820237-6) Avail: NTIS HC A02/MF A01

The MAC detector features a large solid angle electromagnetic/hadronic calorimeter system, augmented by magnetic charged particle tracking, muon analysis and scintillator triggering. Its implementation in the context of electron-positron annihilation physics is described, with emphasis on the utilization of calorimetry. DOE

N83-21328# Pacific Northwest Lab., Richland, Wash.
REAL TIME SENSORS IN GEOTHERMAL FLUIDS, THEIR COSTS AND BENEFITS
George A. Jensen, Donald W. Shannon, and Richard F. Hazelton Feb. 1982 22 p refs Presented at the Can. Western Region Meeting of the Natl. Assoc. of Corrosion Engr., Victoria, British Columbia, 23-27 Feb. 1982
(Contract DE-AC06-76RL-01830)
(DE82-014857; PNL-SA-10229; CONF-820248-1) Avail: NTIS HC A02/MF A01

Geothermal power plants, and several cases where problems were identified and in some cases prevented are discussed. Cost factors, savings, and benefits costs to the sponsor are summarized and the benefits of installation of real time instrumentation in the power plant are characterized. DOE

N83-21329# Princeton Univ., N. J. Plasma Physics Lab.
LOW-ENERGY NEUTRAL-ATOM SPECTROMETER
D. E. Voss and S. A. Cohen Apr. 1982 60 p refs
(Contract DE-AC02-76CH-03073)
(DE82-012761; PPPL-1884) Avail: NTIS HC A04/MF A01

The design, calibration, and performance of a low energy neutral atom spectrometer are described. Time of flight analysis is used to measure the energy spectrum of charge exchange deuterium atoms emitted from the PLT Tokamak plasma in the energy range from 20 to 1000 eV. The neutral outflux is gated on a 1 micron sec time scale by a slotted rotating chopper disc, supported against gravity in vacuum by magnetic levitation, and is detected by secondary electron emission from a Cu-Be plate. The energy dependent detection efficiency has been measured in particle beam experiments and on the Tokamak so that the diagnostic is absolutely calibrated, allowing quantitative particle fluxes to be determined with 200 micron sec time resolution. In addition to its present application as a plasma diagnostic, the instrument is capable of making a wide variety of measurements relevant to atomic and surface physics. DOE

N83-21330# California Univ., Livermore. Lawrence Livermore Lab.
OPERATION AND MAINTENANCE MANUAL FOR LEA76-134 COMPACT STREAK CAMERA
S. W. Thomas 10 Sep. 1982 99 p refs
(Contract W-7405-eng-48)
(DE83-002280; LLL/M-138) Avail: NTIS HC A05/MF A01

This manual describes the ultra-fast streak camera which measures photon intensity vs time. The input photon wavelength range is from the near infrared of about 1.2 micrometers (longest usable wavelength for the S1 photo cathode) to below 100 eV X-rays (12 nm). The camera is capable of resolving events separated in time by 7 to 10 ps. The window or aperture time is adjustable from a minimum of about 1.6 ns to 50 ns or longer, with a total of 200 resolvable spots during the aperture time. The linear dynamic range of input intensity exceeds 1000 and is nominally about 2500. Included in the approximately 100 pages of the manual are specifications, precautions, operating instructions, theory of operation, checkout procedure, maintenance instructions, and other information. DOE

N83-22047# Turin Univ. (Italy). Ist. di Fisica Generale.
A PROJECT FOR A MILLIMETRE WAVE INTERFEROMETER NEAR MATTERHORN
G. Silverstro *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 63-64 refs Prepared in Cooperation with CNR, Turin (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22065# Groningen Rijksuniversiteit (Netherlands). Kapteyn Astronomical Inst.
FAR INFRARED CRYOGENIC SPECTROMETERS
J. J. Wijnbergen *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 183-187 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22066# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestriche Physik.
HETEORODYNE SPECTROMETER FOR 10 MICRONS WORKING IN THE CASSEGRAIN FOCUS OF ASTRONOMICAL TELESCOPES
H. Rothermel and H. U. Kaeufl *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 189-196 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22067# Astronomical Inst., Utrecht (Netherlands).
DESIGN OF ACOUSTO-OPTICAL SPECTROMETERS
H. vandeStadt, J. A. Lindenbergh, and J. Claas *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 197-199 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22068# Onsala Space Observatory (Sweden).
SUPERCONDUCTING MIXERS
E. Kollberg *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 201-202 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22069# Groningen Rijksuniversiteit (Netherlands). Dept. of Space Research.
A 185 GHz JOSEPHSON POINT-CONTACT LOW - NOISE MIXER
G. terHorst, H. Schaeffer, and T. Poorter *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 203-205 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22070# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
LOWER-NOISE MOTT DIODES FOR CRYOGENIC MIXERS AT SUBMILLIMETRE WAVELENGTHS
J. Keen *In* Esa The Sci. Importance of Submillimetre Observations Aug. 1982 p 207-211 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N83-21331# Goettingen Univ. (West Germany). Dept. of Obstetrics and Gynecology.
MEASUREMENTS OF THE ELECTROPHORETIC MOBILITY WITH A NEW LASER DOPPLER CYTOPHEROMETER (LAZYPHER) AND CRITICAL EVALUATION OF THE ELECTROPHORESE MOBILITY TEST (EMT) Final Report, Jun. 1981
Walter Hoffmann Bonn Bundesministerium fuer Forschung und Technologie Jan. 1982 44 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-010; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,25

The new developed Laser Doppler Cytopherometer (Lazypher) allows the exact and objective measurement of the electrophoretic mobility of particles. Comparative experiments with the Free Flow Cell Electrophoresis instrument of Hannig showed identical results. The impression that the electrophoretic Mobility Test is not valid for cancer diagnosis has been substantiated. But in its present form with the new instrument (Lazypher) possible improvements, e.g. isolation of lymphocytes, purification of "antigens" or indicator particles, can be estimated objectively for their value for the test system. Author (ESA)

N83-21332# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung

Lasertechnik.

IMAGING BY ACTIVE LASER METHODS

Friedrich Malota Apr. 1982 56 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-804)

(DFVLR-FB-82-21; ESA-TT-804) Avail: NTIS HC A04/MF A01

A scanner-system, driven by piezo-crystals, is described which can deflect radiation of a CO2-laser. The radiation must be available in the form of cw-radiation or in the form of pulses. In the case of the latter form, a supplementary electronic device must be used. The objects which where investigated are mainly spheres of various diameters and wires. The results are presented in form of pictures. Author

N83-21333# United Technologies Research Center, West Palm Beach, Fla. Optics and Technology Lab.

CORONA PREIONIZATION TECHNIQUE FOR CARBON DIOXIDE TEA LASERS Final Report, 5 May - 31 Dec. 1981

Walter R. Kaminski 30 Nov. 1982 113 p refs

(Contract DAAK70-81-C-0077)

(AD-A122552; UTRC/R82-980701-02) Avail: NTIS HC A06/MF A01 CSCL 20/5

An experimental program is reported which investigates the basic physics underlying the surface corona preionization process in CO2 TEA lasers. Measurements were made of UV emission spectra, photoelectron density, current and voltage waveforms and laser output for a matrix of physical parameters known to influence corona preionization. Based upon experimental results, guidelines are given for the design of a corona preionized CO2 TEA laser. Author (GRA)

N83-21334# Naval Research Lab., Washington, D. C. Condensed Matter and Radiation Sciences Div.

UNIFORM LASER ABLATIVE ACCELERATION OF TARGETS AT 10(14)W/CM(2)

S. P. Obenschain, R. R. Whitlock, E. A. McLean, B. H. Ripin, R. H. Price, D. W. Phillion, E. M. Campbell, M. D. Rosen, and J. M. Auerbach 30 Sep. 1982 9 p refs Prepared in cooperation with Lawrence Livermore National Lab.

(Contract DE-AI08-79DP-40092)

(AD-A121425; NRL-MR-4926) Avail: NTIS HC A02/MF A01 CSCL 20/5

We present the first detailed investigations of the ablative acceleration of planar targets while simultaneously using high irradiance (1014 W/sq cm 2), large focal diameters (1 mm) and long laser pulse duration (3 nsec). Included are measurements of target preheat, ablation pressures and uniformity achieved under these conditions. Targets were accelerated to high velocities with velocity profile uniformity approaching that required for high gain pellet implosions. Author (GRA)

N83-21335# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

REVIEW OF RATE DATA FOR REACTIONS OF INTEREST IN HF AND DF LASERS

Norman Cohen and Jerry F. Bott 25 Oct. 1982 48 p refs

(Contract F04701-82-C-0083)

(AD-A122174; SD-TR-82-86; TR-0083(3603)-2) Avail: NTIS HC A03/MF A01 CSCL 20/5

Chemical reactions and energy transfer processes of importance in H2-F2 and D2-F2 chemical lasers are reviewed and the current state of knowledge is evaluated. Best current estimates for these processes are given and the uncertainties assessed. GRA

N83-21336# Schafer (W. J.) Associates, Inc., Wakefield, Mass.

LOW VOLTAGE FREE ELECTRON LASER OPTICS: FIRST STAGE DESIGN

17 Nov. 1982 44 p refs

(Contract N00014-80-C-0515)

(AD-A122326; WJSA-FTR-82-209) Avail: NTIS HC A03/MF A01 CSCL 20/5

This study verified the simple conceptual design parameters of the two stage FEL with detailed calculations of electron dynamics. The agreement between the two is quite reasonable. These calculations assume a plane wave propagating through the wiggler. For a given stable cavity configuration, the actual transverse intensity profiles were then calculated using perturbation techniques. The theory used should be accurate for single pass gains less than 50% and for cavity lengths long compared to the wiggler length. In the continuation of this program, the results of the present calculations will be used to determine the performance of the second stage of the free electron laser that will produce output in the visible portion of the electromagnetic spectrum. GRA

N83-21337# Maryland Univ., College Park. Dept. of Electrical Engineering.

INVESTIGATION OF SMALL TRANSVERSE ELECTRIC CO2 WAVEGUIDE LASERS FOR FUZING APPLICATION

Uhrs Hochuli and Dennis McGuire Oct. 1982 39 p refs Sponsored in part by NSF and Minta Martin Fund

(Contract DAAG39-76-C-0117)

(AD-A122315; HDL-CR-82-117-1) Avail: NTIS HC A03/MF A01 CSCL 20/5

The properties of a compact, transversely excited, pulsed CO2 waveguide laser are studied experimentally with the application of such a laser for an optical fuze transmitter in mind. Such parameters as peak power, pulse width, pulse shape, pulse jitter, repetition rate, beam profile, polarization, laser life, and optimum as mixture are investigated both for 10.6 and 9.6 micron output wavelengths, and for both sealed-off and flowing-gas operation of the laser. A computer simulation of the laser's operation is compared with the experimental results. Author (GRA)

N83-21338# Dartmouth Coll., Hanover, N.H. Dept. of Physics and Astronomy.

CERENKOV MASER AND CERENKOV LASER DEVICE Final Report, 10 Sep. 1979 - 9 Sep. 1982

John E. Walsh Dec. 1982 233 p refs

(Contract DAAG29-79-C-0203)

(AD-A122683; ARO-16572.3-PH) Avail: NTIS HC A11/MF A01 CSCL 20/5

Four documents, which together serve as a review of experimental verification and the theoretical description of stimulated Cerenkov masers, is presented. Multi-hundred KW power levels have been obtained in the longer mm wavelength range and significant power at wavelengths shorter than 1.5 mm have been observed. The relations between resonator dimensions and beam parameters which determine wavelength, gain, and output power, have been established. Author (GRA)

N83-21339# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE OPTICAL SYSTEMS DESIGN OF A VERSATILE LASER INTERFEROMETER

Shinan Chian and Jinhua Wan 23 Nov. 1982 17 p refs Transl. into ENGLISH from Yigi Yibiao Xuebao (China), v. 3, no. 1, 1982 p 34-39

(AD-A122783; FTD-ID(RS)T-0957-82) Avail: NTIS HC A02/MF A01 CSCL 20/6

An easily operated, highly precise and versatile multi-purpose polarized laser interferometer was developed. A quarter wave-plate and polarizing beam-split prism was used so that the contrast of the interference fringes and be adjusted and the adverse effects of stray light reflected from surfaces of the interferometer eliminated. The design of the instrument and some experimental results are given. The method which uses the emitted light plane as the condition to fix the angle of rotation for the polarization analyzing device is analysed, and the method of realizing uniform inclination interference measurement with interchangeable objectives, the apparatus of quick fringe aquisition, and the double rhomboid prism alignment system designed for operating ease are described. Author (GRA)

N83-21340# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DEVELOPMENT OF HARD FILMED LASER MIRRORS
Peifu Gu and Jinfa Tang 29 Nov. 1982 27 p refs Transl. into ENGLISH from Zhejiang Daxue Xuebao (China), no. 2, 1981 p 34-44
(AD-A122785; FTD-ID(RS)T-1070-82) Avail: NTIS HC A03/MF A01 CSCL 20/6

Simple expressions are reported for predicting the optical losses of laser mirrors. Based on the standing wave dispersion in the mirrors, a low loss 23 layer hard film mirror was designed. The major features of this design are that the high refractive index films are made of a mixture of TiO2 and ZrO2, and that one or two optimum film pairs are added to the design. It is possible to produce an excellent hard film mirror using ordinary technology which has a loss of less than 0.2% and a reflective index higher than 99.8%. GRA

N83-21341# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PHENOMENA OF TARGETS IRRADIATED BY AN INTENSE CO2 LASER
Shengjie Xia, Chunkui Wang, Yushou Fu, Baogen Wu, and Huiying Fang 9 Nov. 1982 17 p refs Transl. into ENGLISH from Wuli Xuebao (China), v. 31, no. 3, Mar. 1982 p 379-403
(AD-A122789; FTD-ID(RS)T-0952-82) Avail: NTIS HC A02/MF A01 CSCL 20/5

Using the continuous and pulsed CO2 laser as the main light source, the phenomena produced in the area in front of the target for the effects of the intense laser on target material was studied. Diagnosis was done by high speed interferography and the forming time of the crater and the processes of torsion of the direction of the vapor plume produced by the continuous laser were distinguished. The development of the plasma, the air breakdown and unluminous phenomena such as the vapor plume, shock wave etc., produced by the pulsed laser were observed. The high speed interferography device with pulsed He-Ne laser was used. GRA

N83-21342# California Univ., Livermore. Lawrence Livermore Lab.
LASER WELDING BERYLLIUM IN A DEUTERIUM ATMOSPHERE
G. E. Faulkner, T. J. Ramos, and J. R. Murchie 16 Oct. 1982 17 p refs
(Contract W-7405-eng-48)
(DE83-003312; UCID-19602) Avail: NTIS HC A02/MF A01

Methods for laser welding beryllium in high pressure deuterium atmospheres were investigated. The methods included direct fusion welds, braze welds and fusion welds in aluminum coatings on beryllium. Bead-on-plate laser welds were made in deuterium, argon and helium atmospheres. Severe porosity was observed in welds made in deuterium atmospheres. Weld cracking was observed in welds made in inert gas atmospheres. Weld porosity was the major obstacle to laser fusion welding beryllium in deuterium atmospheres. Braze welding with aluminum reduced porosity, but such braze welds were unacceptable. Fusion welds in high purity aluminum coatings on the beryllium were sound. A hole in beryllium was successfully sealed in deuterium by coating a counterbore around the hole with high purity aluminum and laser welding the aluminum. DOE

N83-21343# Physics International Co., San Leandro, Calif.
IMPLODING PLASMA X-RAY LASER
R. Dukart, G. Dahlbacka, D. Dietrich, R. Stewart, and R. Fortner Nov. 1982 71 p refs Prepared in cooperation with Lawrence Livermore National Lab.
(Contract DE-AC03-81ER-10990)
(DE83-003785; DOE/ER-10990/T1) Avail: NTIS HC A04/MF A01

Neon-like krypton plasmas were studied on the PITHON generator operating as a collisionally pumped X-ray laser system. Improvements made in plasma formation, simultaneity, and linearity, spatially resolved measurements of the plasma electron temperature and density, and progress made in the line identification of highly ionized krypton lines in the XUV region where the lasing lines are predicted to occur are described. Also, the appendices describe the large X-ray diagnostic setup for these experiments and the theory and method of predicted X-ray laser transitions and the small signal gains expected in the inverted transitions. DOE

N83-21344# United Technologies Corp., East Hartford, Conn.
FAR-INFRARED LASER SCANNER FOR HIGH-VOLTAGE-CABLE INSPECTION Final Report
P. K. Cheo, J. R. Dunphy, M. C. Foster, R. W. Gagnon, L. G. Puffer, Jr., and B. B. Silverman Oct. 1982 92 p refs Sponsored by EPRI
(EPRI Proj. 794-3)
(DE83-900570; EPRI-EL-2675) Avail: NTIS HC A05/MF A01

A far infrared (FIR) laser scanner was fabricated and used to simulate the on-line inspection of solid dielectric insulation of high voltage cables employed in underground electric distribution systems. A high speed optical scanner was built to produce a 3600 rotation of a FIR laser beam around the cable at a maximum angular speed of 9000 rpm. A stationary ellipsoidal mirror, which is concentric with the extruded cable, focuses the beam to a spot size of approximately 3 mm inside the cable insulation. In the absence of insulation defects, the beam will pass through the insulation tangentially to the conductor shield without scattering. When defects appear, the beam will be scattered into an angular cone that will be collected by another ellipsoid. The scattered signals, after passing through a high speed rotating optical tracker, are detected by a liquid helium cooled gallium doped germanium photoconductor. The amplitude and waveform of the scattered signal are analyzed and correlated to the size and type of defects. DOE

N83-21345# Los Alamos Scientific Lab., N. Mex.
SIGNAL PROCESSOR FOR A MULTIPARAMETER FLOW CYTOMETER USING MULTILASER EXCITATION
R. D. Hiebert and J. A. Steinkamp Jan. 1982 43 p refs
(Contract W-7405-eng-36)
(DE82-009076; LA-9066-MS) Avail: NTIS HC A03/MF A01

An instrument was designed for use in a multilaser flow system to measure particles and single biological cells. Signals from as many as six input parameters can be processed through a hard wired chassis and a multichannel pulse height analyzer. If an optional microcomputer based data acquisition system is used, eight input parameters can be accepted. Signals are derived from Coulter effect electrical detectors and photodetectors measuring fluorescence and small angle light scatter along the flow stream. The versatile signal processing chassis allows selective correlation of signals for simultaneous or sequential measurements according to geometric arrangement of the lasers, optical path elements, and detectors. DOE

N83-21346# Los Alamos Scientific Lab., N. Mex.
TRANSFORM-LIMITED-BANDWIDTH INJECTION LOCKING OF AN XeF LASER
I. J. Bigio and M. Slatkine 1982 6 p refs Presented at Optical Soc. of Am. Topical Meeting on Laser Techniques for Extreme Ultraviolet Spectroscopy, Boulder, Colo., 8 Mar. 1982
(Contract W-7405-eng-36)
(DE82-014062; LA-UR-82-960; CONF-820336-7) Avail: NTIS HC A02/MF A01

A pulsed Ar-ion laser, operating on the 3511 A line of the doubly ionized species, was used to injection lock an unstable resonator XeF laser. A single longitudinal mode of the Ar-ion laser was selected with a Fabry-Perot etalon, and the resulting XeF bandwidth was measured to be approximately 50 MHz which is the Fourier-transform limit corresponding to the XeF laser pulse duration of approximately 20 ns. Since the XeF B yields X emission originates from more than one upper vibrational level, for this pulse duration it was determined that approximately 60% of the total output was available to be locked to the reference oscillator line. The 2 MW output beam was also found to be near (< 1.5 x) diffraction limited. DOE

N83-21347# Sandia Labs., Albuquerque, N. Mex. Advanced Laser Technology Div.
WAVELENGTH METER FOR PULSED-LASER APPLICATIONS
C. K. Miller Mar. 1982 70 p
(Contract DE-AC04-76DP-00789)
(DE82-014254; SAND-81-0310) Avail: NTIS HC A04/MF A01

A wavelength meter suitable for single shot measurements in pulsed applications was constructed. Wavelength measurement to .0005 nm accuracy was verified, and repetition rates of 13 Hz attained. Detailed analysis of wavemeter performance in terms of optics, electronics, and data reduction is presented. DOE

N83-21348# Sandia Labs., Albuquerque, N. Mex.
UV-LASER TRIGGERING OF MULTI-MEGAVOLT GAS SWITCHES
R. G. Adams, J. R. Woodworth, and C. A. Frost 1982 24 p refs Presented at the 15th Power Modulator Symp., Baltimore, 14 Jun. 1982
(Contract DE-AC03-76DP-00789)
(DE82-016666; SAND-82-0619C; CONF-820626-3) Avail: NTIS HC A02/MF A01

The use of uv lasers to trigger multimegavolt gas switches found in many large pulsed power systems is discussed. Using 77 mJ from a low divergence (100 micro rad) KrF laser system to trigger a 2.8-MV switch, a 1 sigma jitter of 0.5 ns for a series of applied voltages ranging from 65% to 90% of the self break voltage was demonstrated (Jitter is defined as deviation of the data points from a best fit line through the data). In this sequence of measurements, the triggering delay was relatively insensitive to voltage variations, changing by only approximately 2 ns for a 10% change in voltage. The low divergence KrF beam is focused through a hole in one switch electrode, forming a breakdown arc in the high pressure SF6 between the electrodes. Breakdown arcs were demonstrated which stretch all the way across the 11 cm electrode gap in the 2.8-MV switch. The sudden appearance of this conductive breakdown arc triggers the switch. Techniques, applications and results are discussed. DOE

N83-21349# Los Alamos Scientific Lab., N. Mex.
LASER SHOCK-WAVE GENERATION, PROPAGATION AND INTERACTIONS IN LOW-PRESSURE AIR Ph.D. Thesis
Mark David Wilke Feb. 1982 204 p refs
(Contract W-7405-eng-36)
(DE82-011998; LA-9182-T) Avail: NTIS HC A10/MF A01

Strong spherical shock waves were generated in 1 to 50 torr air by irradiating 3.4 micrograms plastic shell targets with 5 to 30 J, 300 psec Nd:glass laser pulses. The shock wave trajectories were measured with an electrostatic framing camera during the luminous phase and a shadowgraphy system during the nonluminous phase. A holographic, two wavelength interferometer obtained both trajectory information and fringe patterns which, after Abel inversion, yielded electron and gas density profiles. The data taken during the early expansion when the target mass has a significant effect were compared with existing analytical calculations and with numerical calculations. A description of the early expansion is given, in which the target mass is taken to be an isentropically expanding gas that supplies energy to a variable energy blast wave in the surrounding air. DOE

N83-21350# Oak Ridge National Lab., Tenn.
DESIGN OF FIR LASERS WITH INTEGRATED PUMP LASERS
D. P. Hutchinson, C. H. Ma, T. R. Price, P. A. Staats, and K. L. VanderSluis 1982 8 p refs Presented at US/Japan Worhshop on Sub-millimeter Diagnostic Tech., Nagoya, Japan, 18 Jan. 1982
(Contract W-7405-eng-26)
(DE82-009630; CONF-820125-3) Avail: NTIS HC A02/MF A01

Tokamak diagnostics require high power, compact, stable FIR sources for plasma diagnostics. In an effort to meet these requirements, an FIR/CO2 laser package that has operated in the rather harsh environment of the ISX-B Tokamak experiment for approximately 5000 discharges totaling an operating time of approximately 3000 h was developed. DOE

N83-21351# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
SCIENTIFIC GOALS OF LASER RANGE MEASUREMENTS
Peter L. Bender 1981 10 p refs
(DE82-905802; NP-2905802) Avail: NTIS HC A02/MF A01

Two of the most important areas of geodynamics to which laser ranging appears capable of making fundamental contributions are discussed. These are worldwide plate tectonic motion measurements and the monitoring of the longer wavelength crustal movements in seismic zones. In both areas, the accuracy and reliability of the results are of great importance, since a factor two improvement in accuracy can reduce the time necessary for detecting anomalous motions by the same factor. The capabilities of other techniques are discussed briefly, and it is argued that laser ranging to satellites is likely to make major contributions to geodynamics if it succeeds in demonstrating higher measurement accuracy than radio techniques. DOE

N83-22071# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
SUBMILLIMETRE RECIEVER WITH LASER LOCAL OSCILLATORS
G. V. Schultz, E. J. Durwen, H. P. Roeser, and R. Wattenbach *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 213-216 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N83-21352# British Library Lending Div., Boston Spa (England). Overseas Service.
PREDICTION OF PENETRATION IN WELDED JOINTS FROM WELDING CONDITIONS. 3. UTILITY FOR DEPTH OF PENETRATION
M. Watanabe and K. Satoh 1982 18 p refs Transl. into ENGLISH from Yosetsu Gakkaishi, (Japan), v. 25, no. 1, Jan. 1956 p 18-23 (BLL-CE-Trans-7904-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

A fundamental treatment of penetration in arc welded joints in relation to welding conditions (e.g. welding speed, current, arc length, electrode diameter) was given. The depth of penetration is for all practical purposes unrelated to arc length. S.L.

N83-21353*# SRI International Corp., Menlo Park, Calif. NASA Technology Applications Team.
ANALYSIS OF THE MARKET FOR A NEW FROZEN COAL RELEASE DEVICE
Steven Taglio Dec. 1981 31 p
(Contract NAS2-10143; SRI Proj. 8134)
(NASA-CR-170101; NAS 1.26:170101) Avail: NTIS HC A03/MF A01 CSCL 13I

Conditions that contribute to coal freezing and the costs of frozen coal handling are discussed. The various methods currently used to handle frozen coal are examined and assessed relative to costs, effectiveness, and advantages and disadvantages. A NASA designed gas detonation lance for breaking the ice bonds between frozen coal nuggets is described and illustrated. Market demand for the controlled gas detonation lance is estimated to be at least 10 units. A.R.H.

N83-21354*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EMU BATTERY/SMM POWER TOOL CHARACTERIZATION STUDY
Charles Palandati 12 Jan. 1982 51 p refs
(NASA-TM-84975; NAS 1.15:84975) Avail: NTIS HC A04/MF A01 CSCL 13I

The power tool which will be used to replace the attitude control system in the SMM spacecraft was modified to operate

from a self contained battery. The extravehicular mobility unit (EMU) battery was tested for the power tool application. The results are that the EMU battery is capable of operating the power tool within the pulse current range of 2.0 to 15.0 amperes and battery temperature range of -10 to 40 degrees Celsius. E.A.K.

N83-21355# National Centre of Tribology, Risley (England). European Space Tribology Lab.
SATELLITE SLIP RING PERFORMANCE: A SUMMARY OF EUROPEAN SPACE TRIBOLOGY LABORATORY (ESTL) Progress Report, 1974 - 1981
J. C. Anderson and E. W. Roberts Paris ESA Aug. 1982 74 p refs
(Contract ESA-4099/79/NL-PP)
(ESA-ESTL-053; ESA-CR(P)-1663) Avail: NTIS HC A04/MF A01

This report describes the results of work, carried out at ESTL over a period of seven years, on various aspects of slip ring and brush performance with the object of meeting satellite requirements. The aspects covered include wear and electrical noise measurements using a range of different materials and at different speeds; contact resistance and friction measurements, including the effect of brush load; the influence of contamination from some polymers on electrical performance and experiments to study the feasibility of attracting wear debris electrostatistically. Additionally results are presented which summarize slip ring performance in three mechanisms (two solar array drives and a despin mechanism) which have been the subject of real life testing at ESTL during the period in question. It is generally concluded that commercially available silver, MoS2 brush materials give adequate all round performance for existing applications. Developmental brush materials of low MoS contact are potentially employable in low speed applications. Author

N83-21356# Mindrum Precision Products, Rancho Cucamonga, Calif.
HIGH TEMPERATURE BEARING AND DRY-LUBRICATION CONCEPTS, VOLUME 2 Final Report
August O. Weilbach Sep. 1982 23 p
(Contract N00014-82-C-0248; DARPA Order 4477)
(AD-A122542; MPP-82-1027-Vol-2) Avail: NTIS HC A02/MF A01 CSCL 11/2

Test-log records are reduced to readily understandable data showing the conditions the solid lubricants and the test-bed bearing were subjected to. Illustrations describe the test-rig and indicate bearing material defects and present views of surfaces with and without lubricant coating. Author (GRA)

N83-21357# Detroit Diesel Allison, Indianapolis, Ind.
FULL-AUTHORITY FAULT-TOLERANT ELECTRONIC ENGINE CONTROL SYSTEM FOR VARIABLE CYCLE ENGINES Final Report, 1 Sep. 1979 - 30 Apr. 1982
Laura Baker, W. E. Brainard, C. E. Curry, Charles P. Disparte, L. J. Dolny, R. E. Fleming, and Dennis E. Warner Wright-Patterson AFB, Ohio AFWAL Apr. 1982 161 p refs Prepared in cooperation with Systems Control Technology, Palo Alto, Calif. and Delco Electronics, Santa Barbara, Calif.
(Contract F33615-79-C-2002; AF Proj. 3066)
(AD-A121746; DDA-EDR-10895; AFWAL-TR-82-2037) Avail: NTIS HC A08/MF A01 CSCL 21/5

The objective of this program was to develop a design approach for full-authority digital electronic control systems with reliability the primary consideration factor. The approach used in attacking this objective was to identify a baseline full-authority digital electronic control system for and advanced fighter aircraft and then improve on this baseline control with respect to specific goals using redundancy, recovery strategies, and maintenance philosophies. Ambitious goals were established for controls-related mission reliability (2.5 mission aborts per million operating hours), mean time between control removals (1800 hours), and fail operational capability. Candidate control designs were evaluated with respect to cost and weight in addition to their ability to satisfy the design goals. The baseline control system was modularized to yield identifiable components (pumps, thermocouples, actuators, etc.). For these components, reliability and cost information was accumulated. Many of these configurations were screened with a Markov-based constant failure rate analysis simulation called the Generalized Reliability and Maintainability Program (GRAMP). A Generalized Reliability and Maintainability Simulator (GRAMS) tested promising configurations from GRAMP, using a time-varying analysis approach based on Monte Carlo techniques. The results of the GRAMP and GRAMS analysis showed necessary cost and weight increases associated with achieving an order of magnitude improvement in mission reliability by using a fault-tolerant structure as opposed to the baseline system. GRA

N83-21358# Army Construction Engineering Research Lab., Champaign, Ill.
SUMMARY OF REPAIR TECHNIQUES FOR ALUMINUM BRIDGING Final Report
Derrick Brockman and Robert A. Weber Oct. 1982 23 p refs
(DA Proj. 4A7-62731-AT-41)
(AD-A122333; CERL-TR-M-324) Avail: NTIS HC A02/MF A01 CSCL 13/8

Joining processes which could be used in the field to repair aluminum bridging were investigated. A literature search was conducted to identify the various aluminum repair processes available. The merits of each method as a field repair procedure were then evaluated. The available systems identified were gas metal arc welding, shielded metal arc welding, gas tungsten arc welding, gas welding, resistance spot welding, adhesive bonding, electron beam and laser welding, explosion welding, and ultrasonic welding. These processes were evaluated in terms of their strength, corrosion resistance, ease of use, safety, whether their equipment was adaptable to use in the field, and economy. Based on these criteria, four processes were identified as being acceptable for use in the field. These were: gas metal arc welding, gas tungsten arc welding, adhesive bonding, and explosion welding. GRA

N83-21359# McDonnell Aircraft Co., St. Louis, Mo.
EVALUATION OF SPHERICAL BEARINGS WITH PH13-8 MO BALL MATERIAL Final Report, Feb. 1981 - May 1982
L. M. Walsh May 1982 105 p refs
(Contract N62269-81-C-0242)
(AD-A122277; NADC-82208-60) Avail: NTIS HC A06/MF A01 CSCL 13/9

The objective of this program was to demonstrate that passive PH13-8 Mo is a viable alternate to 440C as ball material for MS spherical bearings. Sixty spherical bearings with passivated PH13-8 Mo balls from two suppliers, were tested at room temperature and 325 F, both dry and with liquid contaminants, at liner stress levels of 40 KSI and 25 KSI. The results were compared to the results of an identical program previously performed at MCAIR with bearings having 440C ball material. Author (GRA)

N83-21360# Rockwell International Corp., Golden, Colo.
BONDING OF BERYLLIUM USING ALUMINUM COATINGS
J. R. Roper and C. W. Nordin 13 Nov. 1982 11 p refs
(Contract DE-AC04-76DP-03533)
(DE83-003823; RFP-3381) Avail: NTIS HC A02/MF A01

Lapped beryllium coupons were bonded to high strengths using sputtered aluminum coatings. The effects of coating thickness and short-term storage on bond strength were investigated, and it was determined that coatings as thin as 0.00025 in. and storage times of up to one week can result in high strength bonds. DOE

N83-21361# General Electric Co., San Jose, Calif. Nuclear Power Systems Div.
MODAL CHARACTERISTICS OF A BWR/6-238 JET PUMP
J. F. Schardt Sep. 1982 71 p refs
(Contract DE-AC02-77ET-34209)
(DE83-003974; GEAP-22202) Avail: NTIS HC A04/MF A01

Four prototype BWR/6-238 jet pumps (two jet pump pairs) were flow-induced vibration tested in the high flow hydraulic facility, (HF), over the Shake tests were conducted on one jet pump pair to identify natural frequencies and mode shapes. The results were compared with predictions from the SAP finite element model used

to establish BWR plant preoperational and startup vibration criteria. Agreement was reasonably good as all but one of the first nine predicted modes were recognizable, and the two lowest predicted natural frequencies were within 14% of the measured values. The primary differences were the absence from the HF test results of the third predicted mode (at 37 Hz), and the absence from the analytical predictions of the fifth and seventh measured modes (at 47 Hz and 52 Hz). These differences appear to be primarily related to the mixer-diffuser slip-joint interface conditions. DOE

N83-21362# Dayton Univ., Ohio.
EJECTOR-TURBINE STUDIES AND EXPERIMENTAL DATA Final Report, 1 Aug. 1979 - 31 Oct. 1982
J. E. Minardi, M. O. Lawson, R. V. Krolak, R. K. Newman, H. P. vonOhain, I. O. Salyer, F. L. Wattendorf, L. I. Boehman, and R. P. Braden Nov. 1982 136 p refs
(Contract DE-AC02-79ER-10509)
(DE83-004085; DOE/ER-10509/1) Avail: NTIS HC A07/MF A01

An innovative low-power Rankine turbine concept is described which promises competitive efficiencies, low cost, significant reduction in rpm, low maintenance, and long-life operation over similarly rated turbines. The cycle uses a highly efficient two-fluid ejector which greatly lowers the turbine inlet pressure and temperature. The two-fluid ejector cycle is shown by theoretical studies to be capable of transferring energy at efficiencies in excess of 90% from a high-power flux fluid medium to a low-power flux fluid medium. The volume flow of the thermodynamic fluid can be augmented by as much as one-hundred fold. For very low-power turbine applications this could result in far-more-favorable turbine sizes and rpm. One major application for this type turbine is the heating and cooling with heat pumps. The concept permits engine cycles that cover an extremely broad range of peak temperatures, including those corresponding to stoichiometric combustion of hydrocarbon fuels, waste heat sources, and solar. Actual test data indicated ejector efficiencies as high as 85%. A two-fluid, ejector turbine was designed and tested. The turbine achieved 94% of design power. Additional data indicated that the ejector attached to the turbine operated on the supersonic branch. DOE

N83-21363# Massachusetts Inst. of Tech., Oak Ridge, Tenn. Metals and Ceramics Div.
ANALYSIS OF EFFECT OF TEMPERATURE GRADIENTS ON SURFACE-TENSION PHENOMENA IN GAS-TUNGSTEN-ARC WELDS
H. Andrew Lee and Paul S.-J. Chien Dec. 1982 57 p refs
(Contract W-7405-eng-26)
(DE83-001679; ORNL/MIT-345) Avail: NTIS HC A04/MF A01

Fluid motion directed by surface tension is considered as a contributor to heat penetration in a weld pool. The potential phenomena at the gas-liquid interface were analyzed, and the dependence of surface motion on temperature in the gas tungsten arc (GTA) welding process was examined. An existing heat transfer model was used and was able to predict weld size to +- 50% of the actual value. A momentum transfer equation was derived by considering the contribution of Lorentz force. The momentum boundary condition was developed and was able to predict the Marangoni effect. The magnitude of surface tension driven force is comparable to the gravitational force on one gram. An empirical approach was proposed to couple heat transfer and momentum transfer phenomena. A dimensional analysis identified the pertinent dimensionless groups as Reynolds, Weber, Froude, Peclet, and Power numbers and a dimensionless velocity. A simplified form of the correction was developed by combining dimensionless groups to yield a correlation with the Bond, Prandtl, and modified power numbers. DOE

N83-21364# Mechanical Technology, Inc., Latham, N. Y.
IMPROVED TRANSFORMER-OIL PUMP Final Report
R. B. Howarth and S. Gray Sep. 1982 177 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1797-1)
(DE83-900562; EPRI-EL-2619) Avail: NTIS HC A09/MF A01

A prototype transformer oil circulating pump or system of improved reliability which would not contaminate a transformer with conductive debries either during normal operation or in the event of pump failure was designed. After a review of a wide range of possible alternative pump concepts and assessing their failure modes and merits relative to the major performance criteria, a conclusion was made that a design based on the rotating casing pump principle would most closely meet the program objectives. The detailed design of a prototype rotating casing pump was completed with full manufacturing drawings and parts list. The design was based on nominal operating conditions of 400 gpm (0.025 m(3)/s) and 30 ft (9.1 m) head. It incorporated self-aligning, nonmetallic bearings with positive lubricant supplies, backup bearings, and built in particle separation and filtration systems to protect the pump unit from damage by foreign material and minimize the possibility of conductive debris being generated in the event of a pump failure. DOE

N83-21365# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.
HIGH-TEMPERATURE TURBINE-TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES. DEVELOPMENT OF AN ANALYTICAL METHOD TO DESCRIBE AND PREDICT PARTICULATE DEPOSITION ON TRANSPIRATION-AIR-COOLED TURBINE BLADES
Jul. 1982 49 p refs
(Contract DE-AC01-76ET-10348)
(DE82-022201; CW-WR-76-020.100A; FE-2291-100A) Avail: NTIS HC A03/MF A01

Deposition in gas turbines operating on coal derived fuels is discussed. Included are a literature review, examination of the role of electrophoresis on deposition and experimental results of deposition studies conducted in the gas turbine environment. The experimental studies are related to the charge on hot gases (contaminated and noncontaminated) passing through a turbine and deposition measurements on charged, uncharged, transpiration air cooled, water cooled, and uncooled test samples. It is shown that the electrical charge on hot turbine gases is proportional to particle concentration. The ionic concentration of the gas turbine medium increases with the increase in temperature in the range of 10000 F to 20000 F. The deposition was found to be less for the transpiration air cooled test sample (approx. 13,000 F) and the excessively water cooled test sample (approx. 3500 F) than for the uncooled and uncharged test samples. It was also found that, by using the electrostatic means, a potential exists for a reduction in deposition on gas turbine blades operating in a particulate laden medium. DOE

N83-21366# Solar Turbines International, San Diego, Calif.
CENTAUR GAS-TURBINE MODIFICATION AND DEVELOPMENT FOR SOLAR-FOSSIL HYBRID OPERATION Final Report
P. B. Roberts and A. J. Kubasco Sep. 1982 82 p refs Sponsored by EPRI
(EPRI Proj. 1270-1)
(DE83-900192; EPRI-AP-2550) Avail: NTIS HC A05/MF A01

Conceptual designs of the hardware and systems modifications required to operate the Centaur recuperative gas turbine generator set in a solar fossil hybrid mode were developed. The combustion and control systems were defined as the major technology voids and a single shaft Centaur generator set with a parallel trim combustor selected as the preferred system configuration. A bench scale combustor development program was conducted to generate the design and performance data necessary for preliminary definition of the full size trim combustor. A bench scale trim combustor was developed with the turndown capabilities necessary for the hybrid solar fossil system. DOE

N83-21367# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
FRICTION WELD DUCTILITY AND TOUGHNESS AS INFLUENCED BY INCLUSION MORPHOLOGY
B. J. Eberhard, B. W. Schaaf, Jr., and A. D. Wilson Apr. 1982 25 p refs Presented at the 63rd Ann. Meeting of the American Welding Soc., Kansas City, Mo., 26 Apr. 1982
(Contract DE-AC09-76SR-00001)

(DE82-014198; DPSPU-81-30-19; CONF-820449-1) Avail: NTIS HC A02/MF A01

Friction welding provides consistently high strength, freedom from fusion defects, and high productivity. However, friction welds in carbon steel exhibit impact toughness and bend ductility significantly lower than that of the parent metal. The inclusion content and morphology were suspected to be major contributors to this reduction in weld ductility. Four electric furnace steels, three types of ASTM A516 Grade 70 and ASTM A737 Grade B, were investigated. Friction welds were made by both the inertia and continuous drive processes and the welds evaluated. It was shown that friction welds of inclusion controlled steels exhibited much improved toughness and bend ductility. DOE

N83-21368# Babcock and Wilcox Co., Lynchburg, Va. Nuclear Power Generation Div.

SNUBBER RELIABILITY IMPROVEMENT STUDY Final Report

A. J. Stevens Mar. 1982 215 p refs Sponsored by DOE and EPRI

(DE82-903303; EPRI-NP-2297) Avail: NTIS HC A10/MF A01

As evidenced by the many problems documented there is concern for the reliability of piping system snubbers. Hydraulic fluid leakage was first identified as a widespread problem but has been substantially reduced by seal materials. A later problem, failure of operability tests, is now the leading cause of snubber failure. The failure rate due to functional test failures can often be reduced if the acceptance criteria used for the test are relaxed without compromising the technical integrity of the snubber or the restraint function for which it is installed. The acceptance criteria can often be relaxed, but a thorough understanding of major snubber parameters must first be gained. A discussion of each snubber parameter is provided. Additional recommendations are made for qualification and acceptance testing, environmental testing, and maintenance practices. DOE

N83-21369# General Electric Co., San Jose, Calif. Nuclear Engineering Div.

FLOW-INDUCED VIBRATION CHARACTERISTICS OF BWR/6-238 JET

J. F. Schardt Sep. 1982 104 p refs

(Contract DE-AC02-77ET-34209)

(DE83-003103; GEAP-22201) Avail: NTIS HC A06/MF A01

Four prototype BWR/6-238 jet pumps (tow jet pump pairs) were tested to determine their flow induced vibration (FIV) characteristics in the High Flow Hydraulic Facility. Tests consisted of operating the jet pumps, which were heavily instrumented with accelerometers, pressure transducers and strain gages, at the design operating condition, as well as at numerous off design drive flows and M-rations, and at temperatures between 700 F and 1800 F and at 455 psig. Results were combined with those from past jet pump tests to predict the response at reactor temperature (5330 F). Major conclusions reached related to the BWR/7238 jet pump are presented. DOE

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N83-21370# Bundesgesundheitsamt, Berlin (West Germany).

COMPARATIVE ANALYSIS OF THE EFFICIENCY, RELIABILITY, TECHNICAL FEASIBILITY AND COSTS OF METHODS TO CONVERT SEWAGE SLUDGE TO A HYGIENICALLY SAFE CONDITION Final Report, Jul. 1980

Dieter Fuhrmann, Reiman Leschber, Gertrud Mueller, Bernhard Jaeger (Tech. Univ., Berlin), and Uwe Neumann (Tech. Univ., Berlin) Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 113 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-232; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35,20

Due to the development of sewage treatment technology and the construction sewage works and enlargement of older ones, increasing amounts of sewage sludge are produced. Agricultural use of municipal sewage sludge is a practicable way of utilization which, however, is often limited for reasons of hygienic safety. Methods of sewage sludge disinfection which were used in practice or tested extensively, as well as technical innovations in this field are described, and information on their performance with respect to hygienic and technical requirements is given. A direct comparison of processes has turned out to be extremely difficult because disinfection of sewage sludge is only one of the stages of sewage treatment. For comparison, numerous factors have to be taken into account such as plant size, type of sewage and sludge treatment processes, energy costs, sales potential for agicultural use, etc. S.L.

N83-21371*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FABRICATION DIVISION ULTRASONIC INSPECTION SPECIFICATION FOR CRITICALLY STRESSED COMPONENTS

Robert F. Berry, Jr. Feb. 1983 23 p

(NASA-TM-84625; NAS 1.15:84625) Avail: NTIS HC A02/MF A01 CSCL 14D

An ultrasonic inspection specification which incorporates existing industry practices for straight beam modes with a new approach to the angle beam reference standard was developed. The method employs a commercially available letter 'I' die stamp to impress a controlled shape ultrasonic reflector using common hand tools. The specification is designed to produce very stringent inspections and is primarily intended for utilization in the grading of material used in high load-low safety factor applications, such as cryogenic wind tunnel models and support hardware. E.A.K.

N83-21372*# National Aeronautics and Space Administration, Washington, D. C.

ACOUSTIC EMISSION ANALYSIS AS A NON-DESTRUCTIVE TEST PROCEDURE FOR FIBER COMPOUND STRUCTURES

J. Block Jan. 1983 13 p Transl. into ENGLISH from "Schallemissionsanalyse als Zerstorungsfreies Prufverfahren fur Faserverbundstrukturen" rept. DFVLR, Brunswick, Jun. 1982 p 34-37 Original language document was announced as A82-37527 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3542)

(NASA-TM-77011; NAS 1.15:77011) Avail: NTIS HC A02/MF A01 CSCL 14D

The concept of acoustic emission analysis is explained in scientific terms. The detection of acoustic events, their localization, damage discriminaton, and event summation curves are discussed. A block diagram of the concept of damage-free testing of fiber-reinforced synthetic materials is depicted. Prospects for application of the concept are assessed. Author

N83-21373*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.

EFFECTS OF SPECIMEN RESONANCES ON ACOUSTIC-ULTRASONIC TESTING Final Report

James H. Williams, Jr., Elsbeth B. Kahn, and Samson S. Lee Washington NASA Mar. 1983 36 p refs

(Grant NsG-3210)

(NASA-CR-3679; NAS 1.26:3679) Avail: NTIS HC A03/MF A01 CSCL 14D

The effects of specimen resonances on acoustic ultrasonic (AU) nondestructive testing were investigated. Selected resonant frequencies and the corresponding normal mode nodal patterns of the aluminum block are measured up to 75.64 kHz. Prominent peaks in the pencil lead fracture and sphere impact spectra from the two transducer locations corresponded exactly to resonant frequencies of the block. It is established that the resonant frequencies of the block dominated the spectral content of the output signal. The spectral content of the output signals is further

influenced by the transducer location relative to the resonant frequency nodal lines. Implications of the results are discussed in relation to AU parameters and measurements. E.A.K.

N83-21374# Tetra Tech, Inc., Arlington, Va.
ACOUSTIC NDE OF MULTILAYERED COMPOSITES. PHASE 1: ACOUSTIC MODEL DEVELOPMENT AND INSPECTION OF BRONZE-RUBBER STRUCTURES Final Technical Report, Sep. 1981 - Jun. 1982
Ramesh Shankar, Stephen S. Lane, and Thomas J. Paradiso 22 Jul. 1982 80 p refs
(Contract N60921-81-C-0300)
(AD-A122540; TETRAT-A-6139) Avail: NTIS HC A05/MF A01 CSCL 14/2

Development of a consistent and methodological approach to the nondestructive evaluation (NDE) of multilayered structures is of primary importance to the U.S. Navy to improve fleet reliability. Consequently, a project was initiated with Tetra Tech to develop a generic, computer-based acoustic model, and to validate model on bronze-rubber specimen structures by collecting and processing ultrasonic digital data. The report details work performed on the project. The computer based model, written in FORTRAN IV for a general purpose computer, is applicable for normal or off-normal incident excitation, with receiver in pulse-echo, pitch-catch or in array mode. The model can simulate the observed signal for arbitrary frequency response of the transmitting and receiving transducer. In addition the model considers attenuative and mode conversion effects in each layer in predicting the ultrasonic response. Ultrasonic digital data were processed fom a bronze-epoxy-rubber multilayered structure to validate model and to determine suitable digital signal processing methods. These methods included: compensating filters which were frequency dependent to offset attenuation in the media; deconvolution for bandwidth enhancement and to improve resolution, and the cepstrum -- a relatively new method -- to separate the overlapped response from different interfaces. GRA

N83-21375# Dayton Univ., Ohio. Research Inst.
DEVELOPMENT OF NEW NONDESTRUCTIVE TESTING TECHNIQUES FOR USE IN BLADED-DISK DYNAMICS RESEARCH Final Report, Jun. 1980 - Apr. 1982
Kevin G. Harding and James S. Harris Wright-Patterson AFB, Ohio AFWAL Sep. 1982 125 p refs
(Contract F33615-80-C-2011)
(AD-A122403; UDR-TR-82-46; AFWAL-TR-82-2081) Avail: NTIS HC A07/MF A01 CSCL 20/6

This program investigated the feasibility of using moire, speckle interferometry, and multiple wavelength contouring in conjunction with the real-time optical derotation system currently in use. Each of these approaches is addressed separately in this report to provide continuity in the text. The first task addressed is an analysis of the current real-time image-derotated holographic interferometry system being used to present a better understanding of the problems and inherent limitations in the system. In particular, the alignment of the derotator and the aberrations of the optical system are addressed. Based on this analysis, Section 2 presents recommendations and actions to improve the current system. The remainder of this report is dedicated to a discussion of moire, speckle, and multiple wavelength interferometry with particular emphasis on projected fringe moire interferometry. Each approach was evaluated on the basis of the form of data obtained, expense and availability of equipment, range of sensitivity, and possible errors. Section 10 of this report summarizes the results of this program and presents a recommended system for moire interferometry in the AFWAL/POTA facility. GRA

N83-21376# Battelle Columbus Labs., Ohio.
QUALITY ASSURANCE OF HEAT-FUSED BUTT-WELDED PLASTIC JOINTS Annual Report, Jan. 1981 - Jan. 1982
L. House, A. Lustiger, R. W. Hyatt, M. J. Cassady, and R. B. Smith 1982 107 p refs Sponsored by Gas Research Inst.
(GRI Proj. 5080-353-0408)
(PB83-126037; GRI-80/0125) Avail: NTIS HC A06/MF A01 CSCL 13B

A simple and reliable field grade instrument for nondestructively determining the quality of heat fused, butt joints in polyethylene pipe was developed. A proof-of-principle manner, an ultrasonic based, nondestructive examination method for detecting the presence of voids and inclusions, absence of bond, and inadequate fusion in heat fused, butt joints in a 4 inch-diameter polyethylene gas distribution pipe was investigated. The program was successful in that it demonstrated the capability of the ultrasonic pulse-echo concept to detect voids, inclusions, lack of bond, and incomplete fusion. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N83-21377 Prins Maurits Lab. TNO, Rijswijk (Netherlands).
ON THE SIMULATION OF FAILURE IN THE CYLINDER EXPANSION TEST
R. R. Ijsselstein Jun. 1982 32 p refs In ENGLISH; DUTCH summary
(PML-1982-32; TDCK-76869) Copyright. Avail: Issuing Activity

The processes underlying natural fragmentation of warheads were simulated with the standard cylinder expansion test for a nitromethane-filled copper cylinder. This was done with the help of the two dimensional continuum dynamics Lagrangian finite difference code TOODY IV, with two different stress-strain relations. The overall expansion behavior of the cylinder and the general pressure distribution were considered. The first shock reverberations appear to be well described with the finite difference mesh chosen. Furthermore, the stress situation during expansion was analyzed in connection with a particular failure criterion, and an alternative criterion was proposed. The results of the calculations show that both failure models were used with, or incorporated into the TOODY program for the simulation of failure in the cylinder expansion test. B.G.

N83-21378 National Physical Lab., Teddington (England). Div. of Materials Applications.
AN ANALYSIS OF CRACK GROWTH IN PVC
G. D. Dean, L. N. McCartney, P. M. Cooper, and S. Golding Nov. 1982 87 p refs
(NPL-DMA(A)-57; ISSN-0143-7313) Copyright. Avail: Issuing Activity

Measurement and analysis of crack growth under static load in two grades of PVC is reviewed. Fracture mechanics analyses are reviewed briefly and the influence of the viscoelastic character of the polymer is included in a rigorous treatment which is valid when a single craze zone in the plane of the crack exists at the crack tip. The model is however modified in an attempt to account for multiple crazing at the tip using the concepts of primary and secondary crazes. Two limiting cases of the modified model are discussed; the first corresponding to a single craze and the second to extensive multiple crazing. The apparatus and measurement procedures adopted for slow crack growth tests are described and results are presented. Also discussed here is an exercise aimed at using compliance measurements to check published equations for the derivation of stress intensity values. Results are analyzed in to enable the relationship between crack growth rate and stress intensity to be predicted and compared with exprimental data. The shortcomings of the theory in describing growth behaviors in the grades of PVC studied are discussed and modifications to the model and analysis are considered which enable a better description of growth characteristics to be obtained. Author

N83-21379# British Library Lending Div., Boston Spa (England).
METHOD OF CALCULATING STRESSES AND STRAINS DURING

PRESSURE WORKING OF MATERIALS
E. N. Chumachenko, A. N. Skorokhodov, A. I. Aleksandrovich, O. M. Smirnov, and B. G. Grafov 13 Dec. 1982 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Metall. (USSR), v. 11, 1981 p 89-93
(BLL-M-26839-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A procedure is suggested for calculating slow flows of compressed media with complex physical properties in the zone of changing boundaries during deformation. The procedure enables approximate solutions to be obtained with a computer to within a specifically desired degree of accuracy. S.L.

N83-21380# British Library Lending Div., Boston Spa (England).
ANALYSIS OF THE STRESSED STATE OF TUBES DURING EXTRUSIONS WITH ACTIVE FRICTION FORCES
Ya. M.L Okhrimenko, V. N. Shcherba, and D. B. Efremov 13 Dec. 1982 7 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Chern. Metall. (USSR), v. 11, 1981 p 85-89
(BLL-M-26838-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The presented analysis of the stressed state of extruded tubes demonstrates the prospects of the use of active friction forces for extrusion in that it offers distinct possibilities with respect to control of the components of the stress strain state and as a result of the properties of the extruded tubes after high speed extrusion. Author

N83-21381 British Library Lending Div., Boston Spa (England).
UNSTABLE FRACTURE FROM STABLE FIBROUS CRACK GROWTH, PART 3
T. Kanazawa, S. Machida, and S. Aihara [1983] 14 p refs Transl. into ENGLISH from Nippon Zosen Gakkai Rombunshu (Japan), no. 150, 1981 p 527-532
(BLL-Risley-Tr-4686-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Cracking caused by stress corrosion, etc. is known to occur in chemical or nuclear power plant pipework, and one of the ways of evaluating the safety of plants containing such pipes is to use the 'leak before break' (LBB) concept. The basic assumption of the LBB concept is that, should ductile fracture be initiated from a crack in the pipes, operation can still be halted in time to avoid loss of function of the plant as a whole by detecting the leakage of internal fluid, provided that fracture growth is stable until the crack penetrates the pipe wall. A method of deducing stability or instability of ductile crack growth in surface notched plates using tearing instability theory is investigated. S.L.

N83-21382 British Library Lending Div., Boston Spa (England).
UNSTABLE FRACTURE FROM TABLE FIBROUS CRACK GROWTH, PART 2
T. Kanazawa, S. Machida, Y. Kuriyama, and S. Aihara [1983] 22 p refs Transl. into ENGLISH from Nippon Zosen Gakkai Rombunshu (Japan), no. 148, 1981 p 205-214
(BLL-Risley-Tr-4685-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Transition from stable growth to unstable propagation in ductile cracking is examined with an experimental investigation of unstable fracture conditions based on the J integral resistance curve (J-R curve) advocated. The validity and limitations of the unstable fracture criterion based on J-R curves and instability conditions using the crack tip opening angle (CTOA) are investigated. This has attracted some attention as a parameter of ductile crack growth. S.L.

N83-21383# Technische Universitaet, Clausthal-Zellerfeld (West Germany). Inst. fuer Tiefbohrkunde und Erdoelgewinnung.
EVALUATION OF CASING LOADS IN DEEP WELLS. TESTING OF CASING PIPES FOR DEEP WELLS Final Report, Feb. 1981
Claus Marx, Michael Burkowsky, and Hartmut Schlueter Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 113 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-019; ISSN-0340-7608;
BMFT-03E3011A/ETS6000A) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,80

Analytical methods to calculate collapse strength of oil field pipes were examined. It is found that there is: (1) evidence of higher collapse strength for oil field pipe with typical diameter wall thickness ratio 20 compared to API calculations; (2) superposition of axial loads for pipes with higher D/t ratios does not influence collapse strength over a wide range of axial loads; (3) total collapse strength of pipe in pipe cemented systems was evaluated and the influence of cement strength under bore hole conditions is shown; (4) gas tightness of special connections under various axial loads is studied and improvement is suggested. For connections a finite analysis was made for 10-3/4' MUST-C which takes torque loads during make-up into account. E.A.K.

N83-21384# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
SWINGPROOF STABILITY OF FIBER BUNDLED CONSTRUCTIONS SUBMITTED TO SOLVABLE FIBERS Final Report, 11 Jun. 1981 [SCHWINGFESTIGKEIT VON IOESBAREN KRAFTEINLEITUNGEN IN FASERVERBUNDKONSTRUKTIONEN]
J. Johann Gerharz and Dieter Schuetz Bonn Bundesministerium der Verteidigung 14 Jun. 1982 141 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVG-FBWT-82-7; LBF-3978) Avail: NTIS HC A07/MF A01; DOKZENTBW, Bonn DM 40

Stepped double shear titanium-graphite/epoxy bonded joints and double shear pure graphite/epoxy bolted joints were statically and cyclically loaded to failure. Thereby the load dependent displacement of the bolted parts were measured. Bonded joints with two different overlap lengths and bolted joints with 100% and 50% load transfer, with clearance and interference fit and with high and low clamping forces were tested. Additionally the influence of local reinforcement of the hole area and of fastener pullout and reinstallation was investigated. These parameters had differential effects on the static and fatigue strength as well as on the deformation behavior and the compliance (bolt constants) during static and cyclic loading. For the bolted joints those parameters were generally beneficial which provided a high and steady fraction of load transferred by friction, and a retardation of bearing damage development. S.L.

N83-21385# Oxford Univ. (England). Dept. of Engineering.
ANALYTICAL AND EXPERIMENTAL METHODS IN ELASTODYNAMIC CRACK PROBLEMS
R. A. W. Mines and R. S. J. Corran 1982 72 p refs
(OUEL-1420/82) Avail: NTIS HC A04/MF A01

A ductile material, such as mild steel, can be embrittled by three external factors, namely: the presence of a notch, the temperature of the material and imposed strain rate. In the case of a notch, yielding takes place at the tip due to high local stresses, the amount of yielding being influenced by the surrounding plastic constraint. Thus, in the case of plane strain, the volume of yielding for a given notch size is less than in the case of plane stress, due to a greater amount of elastic material constraining growth of the plastic zono. This plastic constraint has the effect of raising the stress required to produce plastic flow. The effect of increasing strain rate is similar. Reduction of material temperature also leads to more brittle behavior. Author

N83-21386# Oxford Univ. (England). Dept. of Engineering.
DYNAMIC FRACTURE MECHANICS
R. S. J. Corran Jul. 1982 76 p refs
(OUEL-1421/82) Avail: NTIS HC A05/MF A01

Consider a cylindrical bar with a circumferential crack in which a stress pulse is travelling towards the crack. When the wave reaches the crack plane, some parts of it will be reflected to give a stress free condition on the crack faces, whereas in the ligament the wave will be transmitted unchanged. Assuming that the stress is tensile, the particle velocity will be in the opposite direction to the wave propagation direction, whereas they are the same in

compression. The outside of the bar in the upstream direction is now moving at twice the velocity of the inside. The simple one-dimensional theory breaks down, and a disturbance propagates from the crack tip, which can be considered as a secondary source. Author

N83-21387# Oxford Univ. (England). Dept. of Engineering.
MINIMUM-WEIGHT THIN-WALLED CYLINDERS OF GIVEN TORSIONAL AND FLEXURAL RIGIDITY
B. L. Karihaloo and W. S. Hemp Nov. 1982 13 p refs Sponsored by Royal Society Nuffield Foundation Fund
(OUEL-1438/82) Avail: NTIS HC A02/MF A01

The shape of a doubly symmetrical thin-walled cylinder of constant wall thickness and given contour length is obtained analytically. The shape uses the least amount of material in providing prescribed minimum stiffness in torsion and in bending in a principal plane. The shape optimization problem is defined parametrically, and the resulting necessary optimality condition is solved in a closed form. M.G.

N83-21388*# Lehigh Univ., Bethlehem, Pa.
A NOTE ON THE CRACKED PLATES REINFORCED BY A LINE STIFFENER
O. S. Yahsi and F. Erdogan Jan. 1983 14 p
(Grant NGR-39-007-011)
(NASA-CR-166095; NAS 1.26:166095) Avail: NTIS HC A02/MF A01 CSCL 20K

The problem of a cracked plate reinforced by a line stiffener is reconsidered. The original solution of this problem was given in the literature. Also, a variation of the problem with debonding between the plate and the stiffener near the cracked region was reported in the literature. However, the special case of the problem in which the crack tip terminates at the stiffener does not appear to have been studied. In practice, the solution may be necessary in order to assess the crack arrest effectiveness of the stiffener. The problem of a stiffened plate with a crack is reformulated, the asymptotic stress state near the crack tip terminating at the stiffener is examined, and numerical results are given for various stiffness constants. S.L.

N83-21389*# Lehigh Univ., Bethlehem, Pa.
INTERNAL AND EDGE CRACKS IN A PLATE OF FINITE WIDTH UNDER BENDING
H. Boduroglu and F. Erdogan Mar. 1983 27 p refs
(Grants NGR-39-007-011; NSF ENG-78-09737)
(NASA-CR-166094; NAS 1.26:166094) Avail: NTIS HC A03/MF A01 CSCL 20K

Internal and edge cracks were studied by using Reissner's transverse shear theory. The effect of stress-free boundaries on the stress intensity factors in plates under bending were investigated. Among the results found, particularly interesting are those relating to the limiting cases of the crack geometries. The numerical results are given for a single internal crack, two collinear cracks, and two edge cracks. The effect of Poisson's ratio on the stress intensity factors was studied. B.G.

N83-21390*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Engineering.
DEVELOPMENT OF A SIMPLIFIED ANALYTICAL METHOD FOR REPRESENTING MATERIAL CYCLIC RESPONSE
Vito Moreno Jan. 1983 91 p refs
(Contract NAS3-22821)
(NASA-CR-168100; NAS 1.26:168100; PWA-5843-13) Avail: NTIS HC A05/MF A01 CSCL 20K

Development of a simplified method for estimating structural inelastic stress and strain response to cyclic thermal loading is presented. The method assumes that high temperature structural response is the sum of time independent plastic and time dependent elastic/creep components. The local structural stress and strain response predicted by linear elastic analysis is modified by the simplified method to predict the inelastic response. The results with simulations by a nonlinear finite element analysis and used time independent plasticity and unified time dependent material model are compared. E.A.K.

N83-21391*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TIRE MODELING
John A. Tanner, comp. Washington Mar. 1983 245 p refs Workshop held in Hampton, Va., 7-9 Sep. 1982
(NASA-CP-2264; L-15578; NAS 1.55:2264) Avail: NTIS HC A11/MF A01 CSCL 20K

The workshop was organized into six sessions dealing with finite element developments, applications to tire dynamic problems, solution techniques for tire contact problems, experimental data, tire thermal studies, and current design practices. For individual titles, see N83-21392 through N83-21401.

N83-21392*# George Washington Univ., Washington, D.C. Joint Inst. for Advancement of Flight Sciences.
FINITE ELEMENT MODELING AND ANALYSIS OF TIRES
Ahmed K. Noor and C. M. Andersen (Coll. of William and Mary) *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 1-38 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

Predicting the response of tires under various loading conditions using finite element technology is addressed. Some of the recent advances in finite element technology which have high potential for application to tire modeling problems are reviewed. The analysis and modeling needs for tires are identified. Reduction methods for large-scale nonlinear analysis, with particular emphasis on treatment of combined loads, displacement-dependent and nonconservative loadings; development of simple and efficient mixed finite element models for shell analysis, identification of equivalent mixed and purely displacement models, and determination of the advantages of using mixed models; and effective computational models for large-rotation nonlinear problems, based on a total Lagrangian description of the deformation are included. Author

N83-21393*# Texas Univ., Austin. Dept. of Electromagnetics.
FINITE ELEMENT METHODS FOR NONLINEAR ELASTOSTATIC PROBLEMS IN RUBBER ELASTICITY
J. Tinsley Oden, E. B. Becker, T. H. Miller, T. Endo, and E. B. Pires *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 39-70 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

A number of finite element methods for the analysis of nonlinear problems in rubber elasticity are outlined. Several different finite element schemes are discussed. These include the augmented Lagrangian method, continuation or incremental loading methods, and associated Riks-type methods which have the capability of incorporating limit point behavior and bifurcations. Algorithms for the analysis of limit point behavior and bifurcations are described and the results of several numerical experiments are presented. In addition, a brief survey of some recent work on modelling contact and friction in elasticity problems is given. These results pertain to the use of new nonlocal and nonlinear friction laws. Author

N83-21394*# Bendix Corp., South Bend, Ind. Brake and Strut Div.
APPLICATION OF TIRE DYNAMICS TO AIRCRAFT LANDING GEAR DESIGN ANALYSIS
Raymond J. Black *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 71-94 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

The tire plays a key part in many analyses used for design of aircraft landing gear. Examples include structural design of wheels, landing gear shimmy, brake whirl, chatter and squeal, complex combination of chatter and shimmy on main landing gear (MLG) systems, anti-skid performance, gear walk, and rough terrain loads and performance. Tire parameters needed in the various analyses are discussed. Two tire models are discussed for shimmy analysis, the modified Moreland approach and the von Schlippe-Dietrich

approach. It is shown that the Moreland model can be derived from the Von Schlippe-Dietrich model by certain approximations. The remaining analysis areas are discussed in general terms and the tire parameters needed for each are identified. Accurate tire data allows more accurate design analysis and the correct prediction of dynamic performance of aircraft landing gear. Author

N83-21395*# Texas A&M Univ., College Station. Dept. of Civil Engineering.
A TIRE CONTACT SOLUTION TECHNIQUE
John T. Tielking *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 95-122 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

An efficient method for calculating the contact boundary and interfacial pressure distribution was developed. This solution technique utilizes the discrete Fourier transform to establish an influence coefficient matrix for the portion of the pressurized tire surface that may be in the contact region. This matrix is used in a linear algebra algorithm to determine the contact boundary and the array of forces within the boundary that are necessary to hold the tire in equilibrium against a specified contact surface. The algorithm also determines the normal and tangential displacements of those points on the tire surface that are included in the influence coefficient matrix. Displacements within and outside the contact region are calculated. The solution technique is implemented with a finite-element tire model that is based on orthotropic, nonlinear shell of revolution elements which can respond to nonaxisymmetric loads. A sample contact solution is presented. Author

N83-21396*# Iowa State Univ. of Science and Technology, Ames. Dept. of Mechanical Engineering.
ANALYTICAL AND EXPERIMENTAL STUDY OF A STANDING TORUS WITH NORMAL LOADS
Michael J. Mack, Jr. (Hewlett-Packard Co.), Daniel E. Hill (Deere and Co.), and Joseph R. Baumgarten *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 123-140 refs (For primary document see N83-21391 11-39)
Avail: NTiS HC A11/MF A01 CSCL 20K

Finite element analysis is applied to study the large deflection and stress of a thin-walled pressurized torus loaded by normal contact with a plane. Experimentally determined stresses are compared to those resulting from finite element analysis at various meridional and circumferential coordinates of the torus, including the footprint area. Circumferential strains compare favorably while meridional strains are higher in the finite element analysis, probably due to slippage of the boundary at the rim. The STAGS finite element computer program was used. The purpose of the study was to evaluate the various program options for structural loading, for material modeling, for stress analysis, and for grid refinement. The experimental model, a thin-walled rubber tube mounted on a steel cylindrical rim, provided measured results to compare with various analytical trade-offs. It was found that there was almost no difference in predicted deflections or stress distributions between linear and nonlinear material description. However, the difference between linear analysis and that of geometric nonlinearities utilizing incremental loading was marked. Author

N83-21397*# Iowa State Univ. of Science and Technology, Ames. Dept. of Mechanical Engineering.
EXPERIMENTAL AND FINITE ELEMENT STUDY OF A STANDING TORUS UNDER NORMAL AND TANGENTIAL LOADS
Donald R. Flugrad and Bruce A. Miller *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 141-162 ref (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

The effect of a combined external load consisting of a normal component and a tangential braking force applied to an inflated torus is addressed. Experimental results obtained by photographic study of the contact area between the torus and load plate are presented as well as measurements of the vertical and horizontal displacement of the torus under load. A numerical procedure for displacement analysis is developed in which the finite element program STAGS (Structural Analysis of General Shells) is used in an iterative manner to produce a flat, horizontal footprint surface under force loading. The redistributed force distribution obtained by the iterative process is displayed along with computed meridional and circumferential stresses. Finally, an extension of the iterative method is introduced which eliminates the need to experimentally determine the footprint area. Author

N83-21398*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OVERVIEW OF NASA TIRE EXPERIMENTAL PROGRAMS
John A. Tanner *In its* Tire Modeling Mar. 1983 p 163-174 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

Ongoing aircraft tire experimental programs are reported These programs are designed to measure profile growth due to inflation pressure and vertical loading, contact pressures in the tire footprint, and a number of tire mechanical properties including spring, damping, and relaxation characteristics. Author

N83-21399*# Transportation Systems Center, Cambridge, Mass.
ADHESION TESTING OF AIRCRAFT TIRES
Stephen N. Bobo *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 175-192 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

Adhesion testing appeared to offer a less burdensome alternative to replace some of the dynamometer tests. Accordingly, test results and data were requested from retreaders who had used adhesion testing. Author

N83-21400*# Michigan Univ., Ann Arbor. Dept. of Applied Mechanics and Engineering Science.
HEAT GENERATION IN AIRCRAFT TIRES
Samuel K. Clark *In* NASA. Langley Research Center Tire Modeling Mar. 1983 p 193-210 refs (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

A method was developed for calculating the internal temperature distribution in an aircraft tire while free rolling under load. The method uses an approximate stress analysis of each point in the tire as it rolls through the contact patch, and from this stress change the mechanical work done on each volume element may be obtained and converted into a heat release rate through a knowledge of material characteristics. The tire cross-section is then considered as a body with internal heat generation, and the diffusion equation is solved numerically with appropriate boundary conditions of the wheel and runway surface. Comparison with data obtained with buried thermocouples in tires shows good agreement. Author

N83-21401*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESULTS FROM RECENT NASA TIRE THERMAL STUDIES
John L. McCarty *In its* Tire Modeling Mar. 1983 p 211-222 ref (For primary document see N83-21391 11-39)
Avail: NTIS HC A11/MF A01 CSCL 20K

The testing technique and some results from an experimental study to determine tire temperature profiles to aid in defining the strength and fatigue limitations of the tire carcass structure are described. This effort is part of a program to explore analytically and through experiment the temperature distribution in an aircraft tire during free roll and braked and yawed rolling conditions. Author

N83-21402# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
PARETO OPTIMAL DESIGN OF BEAMS SUBJECTED TO SUPPORT MOTIONS
S. Adali May 1982 28 p refs
(TWISK-261) Avail: NTIS HC A03/MF A01

The optical design of a clamped-hinged beam is determined

with the objectives of minimizing the maximum deflection, maximum normal and shearing stresses and of maximizing the fundamental eigenfrequency. The design variable is the area function of the beam which is approximated by linear splines in order to convert the continuous problem into a finite dimensional one. The multi-objective design problem is formulated by using the concept of Pareto optimality. The design, algorithm consists of successive stages of analysis and optimization. Each analysis is carried out by iteratively solving an equivalent integral equation formulation of the original problem. Mathematical programming techniques are employed for optimization. The numerical results for a number of design examples are presented in the form of graphs of optimal trade-off curves which give the optimum performance of the structure with respect to specified objectives. M.G.

N83-21403# Cape Town Univ. (South Africa). Dept. of Civil Engineering.
THE PREDICTION OF LARGE PERMANENT DEFORMATIONS IN RIGID-PLASTIC IMPULSIVELY LOADED FRAMES
P. D. Griffin and J. B. Martin 1982 25 p refs
Avail: NTIS HC A02/MF A01

The behavior of metal beams and frames subjected to large impulsive loading is discussed. The elastic response is ignored, and the material is considered as rigid-plastic. Earlier work is extended to provide an analytical technique which models the material as homogeneous viscous in order to account for strain rate effects, and which uses a direct numerical method of analysis to model non-modal behavior of the structure. The technique is shown to give very good predictions even when displacements are very large (in the order of the dimensions of the frame). Author

N83-21404# Battelle Columbus Labs., Ohio.
MCIC CURRENT AWARENESS BULLETIN, ISSUE NO. 120/121
Frank J. Jelinek, ed. Mar. 1983 11 p refs
(Contract DLA900-78-C-1715)
(Issue-120/121) Avail: NTIS HC A02/MF A01

A detailed economic analysis of the costs of fracture is given. The cost of fracture and its prevention for all types of materials, including metals and alloys, inorganic materials (such as concrete, ceramics, and glass), organic materials (like wood, plastics, and rubber), and laminated structures was studied. Brittle fracture, ductile rupture, fatigue, creep, thermal shock, and all other types of fracture were considered. The costs of actual failures; pain, injury, death, and medical treatment to victims; business delays or property damage; insurance administration; cargo losses; environmental clean ups; and prevention through design and inspection were considered. The $119 billion tab for fracture and its prevention, expressed in 1982 dollars, amounts to about 4 percent of the gross national product. It was found that the most significant costs are incurred by the manufacturing, transportation, and construction industries. R.J.F.

N83-21405# British Library Lending Div., Boston Spa (England).
MODELLING MEASURES OF SPEED, STRESS AND STRAIN DURING PLASTIC FLOW
D. I. Suyarov and I. F. Izosimov 20 Dec. 1982 5 p refs Transl. into ENGLISH from IZV. Vyssh. Zaved. Chern. Met., (USSR), v. 12, 1981 p 34-37
(BLL-M-26877-(5828.4)) Avail: NTIS HC A02/MF A01

The plastic deformation model proposed generalizes the theory of slip lines. It is based on the existence of 13 'characteristic plane planes' forming a hexahedron. S.L.

N83-21406# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section: Construction Metallique.
COMPUTER PROGRAM FOR ELASTIC STRESS: ANALYSIS OF TUBULAR HEAT EXCHANGERS
Frank vanDenberghe and Daniel vanLeeuwen Dec. 1981 43 p refs Presented at Sem. on Machine Mech., (Ghent) Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-151) Avail: NTIS HC A03/MF A01

An analytical model is described for use in the analysis of the mechanical behavior of shell and tube heat exchangers. Based on this model the computer program 'TUBA' for stress analysis of these exchangers was developed. The main features of 'TUBA' are briefly outlined. Finally, it is shown that the proposed design procedure is in agreement with code requirements, provided these requirements allow for the use of computer models as indicated in, for example, the ASME Boiler and Pressure Vessel Code. S.L.

N83-21407# Naval Ship Research and Development Center, Bethesda, Md.
A REVISION OF THE DYNAMIC DESIGN-ANALYSIS METHOD (DDAM) IN NASTRAN Final Report
Myles M. Hurwitz Dec. 1982 26 p refs Supersedes DTNSRDC-81/073
(SO923001)
(AD-A122566; DTNSRDC-82/107; DTNSRDC-81/073) Avail: NTIS HC A03/MF A01 CSCL 13/13

This report describes the theory, implementation, and use of the Dynamic Design-Analysis Method (DDAM) in the NASTRAN finite element structural analysis computer program. DDAM is the procedure used in the shock design of shipboard equipment. Since such equipment is also frequently analyzed with NASTRAN, the inclusion of DDAM in NASTRAN greatly enhances the efficiency of the design-analysis process. Author (GRA)

N83-21408# Rome Air Development Center, Griffiss AFB, N.Y. Electronic Devices Technology Branch.
ELASTIC CONSTANTS OF QUARTZ
Alfred Kahan May 1982 39 p refs
(AF Proj. 2305)
(AD-A121672; RADC-TR-82-117) Avail: NTIS HC A03/MF A01 CSCL 20/11

The formalism describing the thickness vibrations of anisotropic piezoelectric infintie plates is reviewed. The mathematical treatment is specialized to crystallographically doubly-rotated quartz. Explicit expressions for the piezoelectrically 'stiffened' elastic constants are derived. The validity of currently accepted elastic constant values is discussed. It is concluded that there is a need to redetermine the constants and their temperature coefficients on a geometrically consistent sample set using piezoelectric excitation. Author (GRA)

N83-21409# Army Armament Research and Development Command, Aberdeen Proving Ground, Md.
RPSLID: A ONE-DIMENSIONAL VERSION OF REPSIL Final Report
John D. Wortman Nov. 1982 147 p refs
(AD-A122336; ARBRL-MR-03221) Avail: NTIS HC A07/MF A01 CSCL 19/1

A computer program which calculates the large plastic deformation of thin Kirchhoff shells is presented. The SLID program is more efficient than REPSIL for axially symmetric shells (shells of revolution) and slab symmetric shells. It was used most frequently for deformation calculations in laterally symmetric beams. The numerical algorithm differs from that of REPSIL as recorded in that external, artificial, points are used to define boundary conditions, and that forces are computed between mesh points as well as at mesh points. This gives a better simulation of clamped ends and a more compact, more stable system of difference equations. The report gives instructions for using RPSLID. Listings of the program and the comparison plotting program are given. Two example problems are discussed with tabulated input and output. A number of options, primarily for beams, are tabulated and discussed. GRA

N83-21410# Sandia Labs., Livermore, Calif. Analytical Mechanics Div.
LARGE ELASTIC DEFORMATION OF NONLINEAR AXISYMMETRIC MEMBRANES: A VARIATIONAL APPROACH
Paul E. Nielan Oct. 1982 64 p refs
(Contract DE-AC04-76DP-00789)

(DE83-001851; SAND-82-8053) Avail: NTIS HC A04/MF A01

Variational equations for determining the deformed configuration of a pressurized axisymmetric membrane undergoing constant acceleration are derived. A Mooney-Rivlin material model is used for the membrane and large deformations and strains are accounted for. A Ritz procedure reduces the governing equations to a nonlinear algebraic form. Tensile instabilities are discussed in the context of the analytical solution available for a sphere. DOE

N83-21411# Sandia Labs., Albuquerque, N. Mex.

FRACTURE STUDIES OF BRITTLE MATERIALS. PART 2: CHEMOMECHANICAL EFFECTS OF HYDROGEN ON SODA-LIME GLASS AND SILICON

Robert E. Cuthrell and John J. Mecholsky Oct. 1982 38 p refs

(Contract DE-AC04-76DP-00789)

(DE83-002156; SAND-82-0637) Avail: NTIS HC A03/MF A01

The effects of hydrogen and other environments on the fracture strength of soda lime glass and silicon were investigated using ultrahigh vacuum techniques for precise environmental control. Samples were scribed, soaked, and fractured in vacuum, water vapor, and hydrogen environments. Four point flexure strength measurements, exoelectron emission, constant moment double cantilever beam slow crack propagation, and previous acoustic emission drilling/grinding experiments all show that hydrogen affects crack propagation. In controlled environments, increases in strength of as much as 235% of the vacuum strength were observed for vacuum scribed hydrogen soaked soda lime glass. The separate and synergistic effects of residual stress, hydrogen, water vapor, and air environments are discussed in terms of a hypothesis involving chemical reactions at the surface, residual stress relief in active environments, and stresses arising from diffusional concentration gradients. DOE

N83-21412# Anco Engineers, Inc., Culver City, Calif.

INDUCED-VIBRATION ANALYSIS PROBE FOR MEASUREMENT OF STEAM-GENERATOR TUBE-TO-SUPPORT PLATE CLEARANCE Final Report

Feb. 1982 121 p refs Sponsored by EPRI

(EPRI Proj. S102-3)

(DE82-903300; EPRI-NP-2271) Avail: NTIS HC A06/MF A01

Vibration probe hardware to be used to determine the clearance between steam generator tubes and supports was designed, fabricated, and evaluated. The technique consists of inducing and measuring tube vibratory motion at the support. The project involved testing of prototype hardware with a single tube, multiple support laboratory test rig designed to simulate a variety of environmental and boundary conditions. These conditions included various adjacent support clearances, different preset forces (due to support misalignment) and the presence of water on the secondary side. Since the vibration probe equipment is primarily intended to be used to inspect radioactive nuclear steam generators, the equipment was also tested for remote operation at a full scale mock up. DOE

N83-21413# Sandia Labs., Albuquerque, N. Mex.

DEFORMATION OF A THIN, ELASTIC PLATE TO A DEEP PARABOLIC CYLINDER

R. C. Reuter, Jr. and R. K. Wilson Feb. 1982 21 p refs

(Contract DE-AC04-76DP-00789)

(DE82-012056; SAND-82-0099) Avail: NTIS HC A02/MF A01

Equations governing the elastic deformation of thin plates through large displacements to deep parabolic cylinders are presented and solved. The solution consists of expressions for a spatially distributed surface pressure and uniform rim loads which, when applied to the plate, produce the specified, deep parabolic cylindrical shape. These forming loads are written in dimensionless form for parabolic cylinders of arbitrary focal length and arbitrary rim to rim aperture. Numerical results are presented and limiting values are discussed. The solution and results find immediate application to mechanical forming and adhesive retention of parabolic solar collector components. DOE

N83-21414# Cornell Univ., Ithaca, N. Y. Dept. of Theoretical and Applied Mechanics.

A FINITE ELEMENT ANALYSIS OF METAL FORMING PROBLEMS WITH A VISCOPLASTIC MATERIAL MODEL

Abhijit Chandra and Subrata Mukherjee 1982 35 p refs

(Contract DE-AC02-82ER-12038)

(DE83-004499; DOE/ER-12038/2) Avail: NTIS HC A03/MF A01

A finite-element formulation for viscoplasticity problems in the presence of large strains and deformations is given which is capable of using any of a class of combined creep-plasticity constitutive models with state variables for the description of material behavior. The specific problem considered is plane strain extrusion using the constitutive model originally proposed by Hart. Numerical results are presented for sample problems and the important effects of extrusion speed and friction (at the die-workpiece interface) on the residual stresses in an extruded sample are investigated. The computer program developed is quite general and can be modified to solve problems for other other manufacturing processes like rolling and sheet forming. DOE

N83-21415# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

THE EFFECTS OF GEOMETRIC NONLINEARITIES ON THE BENDING OF COMPOSITE PLATES Final Report, Jun. 1981 - Apr. 1982

P. C. Bhavani and M. W. Hyer Sep. 1982 152 p refs

(Grant AF-AFOSR-0195-81)

(PB83-115675; VPI-E-82-25) Avail: NTIS HC A08/MF A01 CSCL 20K

Equations which govern large deflection behavior of composite plates subjected to applied moments along two opposite edges are derived. The other two opposite edges are free and the influences of initial imperfections, in the form of initial curvatures, are included in the derivation. Theoretical predictions for a number of plates are presented, including the case of an isotropic plate. An experimental setup, designed to load the plates with applied moments, is described. Experimental measurements of deflections of four plates are presented and compared with theory. GRA

N83-21416# Sydney Univ. (Australia). School of Civil and Mining Engineering.

INTERACTION OF LOCAL AND LATERAL BUCKLING IN BEAMS

Mark A. Bradford and Gregory J. Hancock Mar. 1982 70 p refs

(PB83-115717; R-408) Avail: NTIS HC A04/MF A01 CSCL 20K

A nonlinear finite strip method of analysis is described for the post local buckling of geometrically imperfect plate assemblies. The method is used to provide an accurate alternative to the Winter effective width formula for obtaining the effective section of a simply supported I-beam in the post local buckling range of structural response. The effective section of a locally buckled beam with thin flange outstands is used to investigate the resistance of the beam to flexural torsional buckling. The analytical methods developed to assess the nonlinear interaction of local and lateral buckling are compared with experimental test results. GRA

N83-21417# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.

ON DELAMINATION IN PLATES: A UNILATERAL-CONTRACT APPROACH

A. Grimaldi and J. N. Reddy 1982 21 p refs

(Contract N00014-78-C-0647; NR Proj. 064-609)

(PB83-117648; VPI-E-82-23; ONR-TR-31) Avail: NTIS HC A02/MF A01 CSCL 20K

The unilateral contact of plates on an elastic foundation is considered. Both vanishing and finite tensile contact (or adhesion) strength between the plate and the foundation are considered. The approach is used to study delamination due to transverse loads in two-layer plates. Numerical results are presented. GRA

N83-21418# Construction Technology Labs., Skokie, Ill.

SHORT-TERM CREEP OF CONCRETE AT ELEVATED TEMPERATURES

Michael Gillen Sep. 1982 112 p refs
(Contract NB80-NADA-1009)
(PB83-118117; NBS-GCR-82-407) Avail: NTIS HC A06/MF A01 CSCL 13C

Two hundred thirty-one creep strain tests were conducted at temperatures from ambient to 1200F over periods from 6 to 24 hours on 2X4-in. cylindrical concrete specimens. In addition, forty-five compressive strength tests were conducted on heated concrete specimens. Test variables included load (0.30, 0.45, and 0.60 (f' sub c)), temperature (73 to 1200F), rate of heating (0 and 10F/min.), length of heating (6 and 24 hr), aggregate type (calcareous, siliceous, and lightweight), variation of compressive strength with temperature, and concrete relative humidity (0, 50, and 100% RH). A model of short term creep of concrete at elevated temperatures as a function of significant test variables was developed. GRA

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N83-21419*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EASTERN REGIONAL REMOTE SENSING APPLICATIONS CONFERENCE
Nicholas M. Short, ed. Jan. 1981 240 p refs Conf. held in Easton, Md., 2-5 Oct. 1979 Original contains imagery. Original phototgraphy may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10201; NASA-CP-2173; NAS 1.55:2173) Avail: NTIS HC A11/MF A01 CSCL 08B

The roles and activities of NASA and the National Conference of State Legislatures in fostering remote sensing technology utilization by the states and in promoting interstate communication and cooperation are reviewed. The reduction and interpretation of LANDSAT MSS and aerial reconnaissance data for resources management and environment assessment are described as well as resource information systems, and the value of SEASAT synthetic aperture radar and LANDSAT 4 data. For individual titles, see N83-21420 through N83-21445.

N83-21420*# Council of State Planning Agencies, Washington, D.C.
THE EARTH RESOURCES DATA PROJECT
Peggy Harwood *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 19-24 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The Council of State Planning Agencies, in consultation with the National Governor's Association and NASA, initiated the Earth Resources Data Project to encourage the appropriate application of cost-effective science and technology to state natural resources issues and problems. This project was established to provide a focal point for identifying those issues associated with state use of remote sensing and related technology. One project goal is to elevate to the consciousness of state policy and program officials new technologies, such as LANDSAT, by association with major issues to which policy officials are attuned. The project assists the coordination between the states and NASA and promotes communication on those issues. A related project objective is to encourage technical assistance opportunities for states that will promote better use of remote sensing and natural resources data in state programs. A.R.H.

N83-21421*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.
EARTH RESOURCES LABORATORY TECHNOLOGY TRANSFER PROGRAM
Roy S. Estess *In* NASA. Goddard Space flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 25-29 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The approach to the transfer of satellite remote sensing technology used at the National Space Technology Laboratories'/ Earth Resources Laboratory represents an effective program for the assigned area and is composed of demonstrations; a comprehensive in-house training program; user awareness activities (brochures, slide sets, and documentation); university short courses to stimulate university capabilities; and a technical awareness effort aimed at providing the states with consultation in the areas of hardware/software systems and advice on specific applications. Particular focus is on the transfer of LANDSAT technology in the context of geobased information system development, as well as on how the states approach the problem of institutionalizing the capabilities. The status of demonstration projects and of the state LANDSAT geographic information systems is examined. A.R.H.

N83-21422*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE WESTERN REGIONAL APPLICATIONS PROGRAM (WRAP)
Susan D. Norman *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 31-37 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05A

The states encompassed by the Western Regional Applications Program (WRAP) include Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. The features of the western United States which both help and hinder the use of LANDSAT are discussed as well as their effects on the institutional approaches used for resources management in these states. Operational alternatives and some of the representative LANDSAT projects that WRAP is engaged in are presented. A.R.H.

N83-21423*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA'S EASTERN REGIONAL REMOTE SENSING APPLICATIONS PROGRAM
Philip J. Cressy, Jr. *In its* Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 39-42 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The goals of the Eastern Regional Remote Sensing Applications Program are to establish capability for using LANDSAT technology in state institutions and organizations in an operational mode, and to assist in handling new data, introducing new techniques as they become available, and in building and nurturing the technology within the states. Techniques for application development are supported and workshops and demonstrations are provided to pass information on to users. Major areas of project interest are forest inventory, water inventory, and water clarity, and land cover change detection. Another activity is in adopting software, modifying it to work on users' computers, and in identifying hardware that can be used and tied to user computer systems. Involvement of universities as resources for state and local governments is another element of the program. A.R.H.

N83-21424*# Maryland Dept. of State Planning, Baltimore.
LAND USE PROJECT (COMPARISON OF LANDSAT WITH AIRCRAFT-DERIVED LAND COVER DATA FOR A PROPOSED

HIGHWAY PROJECT)
Thomas Rugoski (Defense Mapping Agency, Rockville, Md.) *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 45-53 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08B

The Maryland Automated Geographic Information System is described as well as the development of a general land cover classification with level 2 separation for vegetation categories for a 95,000-acre study area in Howard and Anne Arundel Counties. An accuracy analysis was performed on two subsections of the entire study area. The 1:24,000 scale land use map and the high in altitude infrared photography were determined to the best source of ground truth for the analysis. Results show that (1) delineation of deciduous and coniferous forested areas from LANDSAT data compared well with results from infrared photography; (2) general classification of agricultural areas showed acceptable results; (3) delineation of residential areas had the highest error rates (difference in interpretation and cover type assignment methods was a primary factor); and (4) LANDSAT-derived land cover data is to be used as an ancillary data source in a Maryland statewide land cover inventory. A.R.H.

N83-21425*# Minnesota Dept. of Natural Resources, St. Paul. Div. of Waters.
IRRIGATION SURVEY IN SHERBURNE COUNTY, MINNESOTA
Dennis Beissel and Dennis Woodward *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 63-68 refs Original contains imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08H

Approximately 70% of Minnesota's irrigation is with center pivot distribution systems whose diagnostic appearance on remotely sensed imagery is a circular pattern which can be readily identified on LANDSAT MSS band imagery. Fields irrigated with traveling guns, laterals, booms, or cornering systems either result in angular field patterns or obscure the circular patterns normally visible on imagery. The IDMS system at Goddard was used to develop a LANDSAT digital classification of the Sherburne County area, which located fields regardless of shape, and was not dependent of visual interpretation. Ground truth collection and classification attempts are described in an effort to inventory all wells in the area. A.R.H.

N83-21426*# Ohio Dept. of Energy, Columbus.
CORRELATION OF LANDSAT LINEAMENTS WITH DEVONIAN GAS FIELDS IN LAWRENCE COUNTY, OHIO
Gene O. Johnson *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 69-73 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08G

In an effort to locate sources of natural gas in Ohio, the fractures and lineaments in Black Devonian shale were measured by: (1) field mapping of joints, swarms, and fractures; (2) stereophotointerpretation of geomorphic lineaments with precise photoquads; and (3) by interpreting the linear features on LANDSAT images. All results were compiled and graphically represented on 1:250, 000 scale maps. The geologic setting of Lawrence County was defined and a field fracture map was generated and plotted as rose patterns at the exposure site. All maps were compared, contrasted, and correlated by superimposing each over the other as a transparency. The LANDSAT lineaments had significant correlation with the limits of oil and gas producing fields. These limits included termination of field production as well as extensions to other fields. The lineaments represent real rock fractures with zones of increased permeability in the near surface bedrock. A.R.H.

N83-21427*# New Jersey Dept. of Environmental Protection, Trenton. Div. of Coastal Resources.
LANDSAT DATA FOR COASTAL ZONE MANAGEMENT
Stewart McKenzie *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 77-85 ref ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08C

The lack of adequate, current data on land and water surface conditions in New Jersey led to the search for better data collections and analysis techniques. Four-channel MSS data of Cape May County and access to the OSER computer interpretation system were provided by NASA. The spectral resolution of the data was tested and a surface cover map was produced by going through the steps of supervised classification. Topics covered include classification; change detection and improvement of spectral and spatial resolution; merging LANDSAT and map data; and potential applications for New Jersey. A.R.H.

N83-21428*# Michigan Dept. of Natural Resources, Lansing.
WILDLIFE HABITAT EVALUATION DEMONSTRATION PROJECT
George E. Burgoyne, Jr. and Larry G. Visser *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 87-89 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 06C

To support the deer range improvement project in Michigan, the capability of LANDSAT data in assessing deer habitat in terms of areas and mixes of species and age classes of vegetation is being examined to determine whether such data could substitute for traditional cover type information sources. A second goal of the demonstration project is to determine whether LANDSAT data can be used to supplement and improve the information normally used for making deer habitat management decisions, either by providing vegetative cover for private land or by providing information about the interspersion and juxtaposition of valuable vegetative cover types. The procedure to be used for evaluating in LANDSAT data of the Lake County test site is described. A.R.H.

N83-21429*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAND COVER ANALYSIS OF JAMES CITY COUNTY, VIRGINIA
James A. Copony (Virginia Div. of Forestry, Charlottsville), Elizabeth M. Middleton, and Belden G. Bly (Computer Sciences Corp., Silver Spring, Md.) *In its* Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 91-97 refs Original contains imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08B

The approach used to obtain reliable countywide forest resource data, including statistics and a forest cover distribution map from LANDSAT data is described. Comparison of results of the LANDSAT anlysis and U.S. Forestry Survey data is presented in a table. Pine, oak/pine, and oak/hickory accounted for 22.3%, 32.6% and 45.2% respectively of the total forest area in the LANDSAT analysis, compared to 22.8%, 30.1%. and 47.1% in the Forest Survey. The corresponding figures for each forest type differ at most 2.5% for the mixed forest. The total county area in forest land measured using LANDSAT was underestimated by 1,409 acres, a 2.2% error based on the Forest Survey statistics. However, the estimate of 61,242 acres fell well within the known 4% uncertainty of the estimate for the Forest Survey figures (62,651 acres + or - 2,544 acres). A.R.H.

N83-21430*# Geological and Economic Survey, Morgantown, West Va.
REMOTE SENSING IN WEST VIRGINIA
Peter Lessing *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 99-104 refs ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF a01 CSCL 08B

Low altitude black and white aerial photography is the prinicipal remote sensing tool for geologic investigations in West Virginia,

although side looking radar and color infrared photography are also used. The first land use/cover map for the state was produced in color infrared and is being digitized. Linear features in Cabell and Wayne Counties, as revealed by LANDSAT, were evaluated to test the possible correlations with rock fractures and gas production from shales. A LANDSAT linear features map (1:250, 000) was prepared for the entire state, also. Presently investigations are being made to understand karst and to predict areas that should not be used for development. Aerial photography and field mapping is being conducted to detect the location and causes of landslides. A.R.H.

N83-21431*# Indiana State Univ., Terre Haute. Dept. of Geography and Geology.
A PROPOSED MODEL FOR APPLIED REMOTE SENSING IN INDIANA
Paul W. Mausel *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 105-109 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08B

A model for the effective interaction of user, technical and consultant groups in incorporating remote sensing into applied research conducted by local, regional, and state agencies is outlined. M.G.

N83-21432*# Michigan Dept. of Natural Resources, Lansing. Div. of Forestry.
LANDSAT, A DATA SUPPLEMENT TO FOREST SURVEY
Gerald Thiede *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 111-113 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 02F

The use of LANDSAT in providing forest data on a county basis was investigated. Image interpretation and classification techniques and their accuracy are addressed. LANDSAT data was also used to detect and delineate defoliation caused by tent caterpillars. M.G.

N83-21433*# New Hampshire Univ., Durham. Cooperative Extension Service.
CLEARCUT MAPPING AND FOREST TYPE MAPPING IN EASTERN FORESTS WITH LANDSAT DATA
Ken Sutherland *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 115-118 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 02F

The development and use of signature packages which provide a forest type map and which identify clearcut areas is discussed. The type map divides the forest land into three categories: softwood, mixed wood, and hardwood. The user defines each of these categories and adjusts the signature package to fit his needs. Success in identifying clearcuts and their stage of regrowth was demonstrated in New Hampshire where clearcuts range in size from 5 to 100 acres with between 30 and 40 acres being the most common. M.G.

N83-21434*# Dartmouth Coll., Hanover, N.H. Earth Resources Group.
FORESTRY APPLICATIONS OF LANDSAT DATA IN NEW HAMPSHIRE
Emily Bryant and Ken Sutherland (New Hampshire Univ., Durham) *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 119-122 refs ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 02F

The applications of forest clearcut maps derived from LANDSAT data are dicussed. Such maps provide harvest location information useful in general management and indicate the stage of regrowth which helps determine timber stand improvement practices. The clearcut maps are also used in fire control planning and in determining wildlife habitats. M.G.

N83-21435*# Wisconsin Univ., Madison. Inst. for Environmental Studies.
LAKE TROPHIC APPLICATIONS: WISCONSIN
Frank Scarpace *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 123-125 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08H

Efforts to classify the water quality characteristics of lakes using LANDSAT imagery are reported. Image processing and registration techniques are described. A lake classification scheme which involves the assignment of a trophic class number was used in the data analysis. The resulting values were compared to the corresponding rank assignment derived from field measurements. M.G.

N83-21436*# Minnesota State Planning Agency, St. Paul.
MINNESOTA LAND MANAGEMENT INFORMATION CENTER
Earl Nordstrand *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 129-133 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

A brief history of the Minnesota Land Management Information Center is given and the present operational status and plans for future development are described. The incorporation of LANDSAT data into the system, hardware and software capabilities, and funding are addressed. M.G.

N83-21437*# Vermont Univ., Burlington. School of Natural Resources.
THE VERMONT OPERATIONAL LANDSAT DATA ANALYSIS SYSTEM
Gary Smith and Roy Whitmore *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 135 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The implementation of the Office of Remote Sensing of Earth Resources (ORSER) software package from Pennsylvania State University onto the University of Vermont's IBM model 3031 computer is discussed. This version of ORSER was found to be much more user-friendly than remote access to the Penn State ORSER package. M.G.

N83-21438*# Massachusetts Univ., Amherst. Remote Sensing Center.
MASSACHUSETTS: THE ESTABLISHMENT OF A REMOTE SENSING CENTER
Michael A. Weinberg *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 137-138 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The objectives of the remote sensing center at the University of Massachusetts are described. These include research, facilities development, applications, education, and regional cooperation. M.G.

N83-21439*# Delaware Univ., Newark. Coll. of Marine Studies.
REMOTE SENSING OF COASTAL PROCESSES AND RESOURCES
V. Klemas *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 139-154 refs ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08C

The use of remote sensors and multispectral analysis techniques in solving environmental and resource management problems in the coastal zone is illustrated. The specific applications discussed include the analysis of coastal vegetation and productivity, remote sensing of estuarine fronts and their effects on oil dispersion, drift and dispersion of ocean-dumped wastes, and multispectral analysis of water pollutants and suspended sediment concentration. M.G.

N83-21440*# Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
MODELING A BEAVER POPULATION ON THE PRESCOTT

PENINSULA, MASSACHUSETTS: FEASIBILITY OF LANDSAT AS AN INPUT
John T. Finn and Rebecca Howard *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 155-162 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 06C

A preliminary dynamic model of beaver spatial distribution and population growth was developed. The feasibility of locating beaver ponds on LANDSAT digital tapes, and of using this information to provide initial conditions of beaver spatial distribution for the model, and to validate model predictions is discussed. The techniques used to identify beaver ponds on LANDSAT are described. M.G.

N83-21441*# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
LAND COVER CLASSIFICATION IN SOUTHERN RHODE ISLAND USING MULTIDATE LANDSAT MSS DATA
Peter Cornillon *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 163-166 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 08B

The use of LANDSAT multispectral scanner data from several different dates to classify ground cover in Rhode Island is discussed. The advantage of using several dates is that seasonal data can be incorporated in the classification. In order to circumvent the problem of increased computer computation time, the dimensionality of the input data is reduced by the 'principal components method'. This technique and its implementation are described along with regisration, classification, and verification tasks. M.G.

N83-21442*# Vermont Univ., Burlington. School of Natural Resources.
FORESTRY: FORUM SUMMARY
Roy Whitmore *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 167-168 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 02F

A synopsis of a forum addressing the use of LANDSAT data in forestry is given. Broad inventory studies, clear-cut monitoring, and insect and disease detection were among the subject areas discussed. Concerns regarding the vailability of data, cloud cover, resolution and classification accuracy, and product format were expressed by foresters. M.G.

N83-21443*# National Aeronautics and Space Administration, Washington, D. C.
NASA'S EARTH RESOURCES PROGRAM: FUTURE OUTLOOK
William L. Piotrowski *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 197-208 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05A

NASA's research and development strategies for future Earth resources systems are outlined. The development of the multilinear array sensor technology, STEREOSAT, future satellites in the LANDSAT series, the Shuttle Imaging Radar, the Operational Earth Resources System, and Spacelab payloads are addressed. M.G.

N83-21444*# State Univ. of New York, Albany. Dept. of Geography.
SEASAT SYNTHETIC APERATURE RADAR DATA
Floyd M. Henderson *In* NASA. Goddard Space Flight Center Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 209-215 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 17I

The potential of radar imagery from space altitudes is discussed and the advantages of radar over passive sensor systems are outlined. Specific reference is made to the SEASAT synthetic aperture radar. Possible applications include oil spill monitoring, snow and ice reconnaissance, mineral exploration, and monitoring phenomena in the urban environment. M.G.

N83-21445*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DATA ACQUISITION AND PROJECTED APPLICATIONS OF THE OBSERVATIONS FROM LANDSAT-D
Darrel L. Williams and Vincent V. Salomonson *In its* Eastern Reg. Remote Sensing Appl. Conf. Jan. 1981 p 217-230 refs ERTS (For primary document see N83-21419 11-43)
Avail: NTIS HC A11/MF A01 CSCL 05B

The capabilities of the multispectral scanner and thematic mapper aboard LANDSAT-D are reviewed in terms of spectral, spatial, and radiometric resolution. The applications made possible by increased sensor sensitivity are discussed. Communication relay systems and the ground segment are also described. M.G.

N83-21446*# Analytic Sciences Corp., Reading, Mass.
MAGSAT INVESTIGATION OF CRUSTAL MAGNETIC ANOMALIES IN THE EASTERN INDIAN OCEAN Final Report, Dec. 1980 - Feb. 1983
Richard V. Sailor and Andrew R. Lazarewicz 22 Feb. 1983 88 p refs ERTS
(Contract NAS5-26424)
(E83-10202; NASA-CR-170050; NAS 1.26:170050; TASC-TR-1325-1) Avail: NTIS HC A05/MF A01 CSCL 08G

Crustal magnetic anomalies in a region of the eastern Indian Ocean were studied using data from NASA's MAGSAT mission. The investigation region (0 deg to 50 deg South, 75 to 125 deg East) contains several important tectonic features, including the Broken Ridge, Java Trench, Ninetyeast Ridge, and Southeast Indian Ridge. A large positive magnetic anomaly is associated with the Broken Ridge and smaller positive anomalies correlate with the Ninetyeast Ridge and western Australia. Individual profiles of scalar data (computed from vector components) were considered to determine the overall data quality and resolution capability. A set of MAGSAT "Quiet-Time" data was used to compute an equivalent source crustal magnetic anomaly map of the study region. Maps of crustal magnetization and magnetic susceptibility were computed from the equivalent source dipoles. Gravity data were used to help interpretation, and a map of the ratio of magnetization to density contrasts was computed using Poisson's relation. The results are consistent with the hypothesis of induced magnetization of a crustal layer having varying thickness and composition. M.G.

N83-21447*# Hydex Corp., Fairfax, Va.
CREATING A BRIDGE BETWEEN REMOTE SENSING AND HYDROLOGIC MODELS Final Report
E. L. Peck, E. R. Johnson, and T. N. Keefer 31 Jan. 1983 121 p refs ERTS
(Contract NAS5-27272)
(E83-10203; NASA-CR-170517; NAS 1.26:170517) Avail: NTIS HC A06/MF A01 CSCL 08H

The development of methods for using remotely sensed measurements with hydrologic models to ensure that simulated results are consistent with observed conditions (model updating) is discussed. Heuristic and full probabilistic approaches are described. The National Weather Service River Forecast System rainfall/runoff and snowmelt models are used in demonstrating the updating procedures. M.G.

N83-21448*# Hydex Corp., Fairfax, Va.
COMBINING REMOTELY SENSED AND OTHER MEASUREMENTS FOR HYDROLOGIC AREAL AVERAGES Interim Report, May - Oct. 1982
E. R. Johnson, E. L. Peck, and T. N. Keefer Greenbelt, Md. NASA. Goddard Space Flight Center 31 Oct. 1982 164 p refs ERTS
(Contract NAS5-27272)
(E83-10204; NASA-CR-170457; NAS 1.26:170457) Avail: NTIS

HC A08/MF A01 CSCL 08H

A method is described for combining measurements of hydrologic variables of various sampling geometries and measurement accuracies to produce an estimated mean areal value over a watershed and a measure of the accuracy of the mean areal value. The method provides a means to integrate measurements from conventional hydrological networks and remote sensing. The resulting areal averages can be used to enhance a wide variety of hydrological applications including basin modeling. The correlation area method assigns weights to each available measurement (point, line, or areal) based on the area of the basin most accurately represented by the measurement. The statistical characteristics of the accuracy of the various measurement technologies and of the random fields of the hydrologic variables used in the study (water equivalent of the snow cover and soil moisture) required to implement the method are discussed. Author

N83-21449*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

LANDSAT-4 IMAGE DATA QUALITY ANALYSIS Quarterly Progress Report, 10 Nov. 1982 - 8 Feb. 1983

Paul E. Anuta, Principal Investigator Feb. 1983 27 p ERTS

(Contract NAS5-26859)

(E83-10205; NASA-CR-170051; NAS 1.26:170051; LARS-021083) Avail: NTIS HC A03/MF A01 CSCL 05B

Analysis during the quarter was carried out on geometric, radiometric, and information content aspects of both MSS and thematic mapper (TM) data. Test sites in Webster County, Iowa and Chicago, IL, and near Joliet, IL were studied. Band to band registration was evaluated and TM Bands 5 and 7 were found to be approximately 0.5 pixel out of registration with 1,2,3,4, and the thermal was found to be misregistered by 4 30 m pixels to the east and 1 pixel south. Certain MSS bands indicated nominally .25 pixel misregistration. Radiometrically, some striping was observed in TM bands and significant oscillatory noise patterns exist in MSS data which is possibly due to jitter. Information content was compared before and after cubic convolution resampling and no differences were observed in statistics or separability of basic scene classes. M.G.

N83-21450*# California Univ., Santa Barbara. Dept. of Geography.

LANDSAT-D INVESTIGATIONS IN SNOW HYDROLOGY Quarterly Progress Report, 17 Nov. - 31 Dec. 1982

Jeff Dozier, Principal Investigator 31 Dec. 1982 4 p refs ERTS

(Contract NAS5-27463)

(E83-10207; NASA-CR-170053; NAS 1.26:170053) Avail: NTIS HC A02/MF A01 CSCL 08L

Snow reflectance in all 6 TM reflective bands, i.e., 1, 2, 3, 4, 5, and 7 was simulated using a delta-Eddington model. Snow reflectance in bands 4, 5, and 7 appear sensitive to grain size. It appears that the TM filters resemble a "square-wave" closely enough that a square-wave can be assumed in calculations. Integrated band reflectance over the actual response functions was calculated using sensor data supplied by Santa Barbara Research Center. Differences between integating over the actual response functions and the equivalent square wave were negligible. Tables are given which show (1) sensor saturation radiance as a percentage of the solar constant, integrated through the band response function; (2) comparisons of integrations through the sensor response function with integrations over the equivalent square wave; and (3) calculations of integrated reflectance for snow over all reflective TM bands, and water and ice clouds with thickness of 1 mm water equivalent over TM bands 5 and 7. These calculations look encouraging for snow/cloud discrimination with TM bands 5 and 7. A.R.H.

N83-21451*# Texas Univ., El Paso. Dept. of Geological Sciences.

[APPLICATION OF MAGSAT TO LITHOSPHERIC MODELING IN SOUTH AMERICA] Quarterly Report, 1 Oct. 1982 - 31 Dec. 1983

G. R. Keller and E. G. Lidiak, Principal Investigators 31 Dec. 1983 1 p ERTS

(Contract NAS5-26326)

(E83-10208; NASA-CR-170054; NAS 1.26:170054) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the determination of relations of MAGSAT anomalies to lithospheric structures is reported. The prime emphasis was on a Rayleigh wave study and the determination of both group and phase velocity dispersion. M.G.

N83-21452*# Business and Technological Systems, Inc., Seabrook, Md.

REMANENT MAGNETIZATION AND THREE-DIMENSIONAL DENSITY MODEL OF THE KENTUCKY ANOMALY REGION Quarterly Report, 12 Oct. - 31 Dec. 1982

31 Dec. 1982 3 p ERTS

(Contract NAS5-27488)

(E83-10210; NASA-CR-170056; NAS 1.26:170056; QR-1) Avail: NTIS HC A02/MF A01 CSCL 05B

Existing software was modified to handle 3-D density and magnetization models of the Kentucky body and is being tested. Gravity and magnetic anomaly data sets are ready for use. A preliminary block model is under construction using the 1:1,000,000 maps. An x-y grid to overlay the 1:2,500,000 Albers maps and keyed to the 1:1,000,000 scale block models was created. Software was developed to generate a smoothed MAGSAT data set over this grid; this is to be input to an inversion program for generating the regional magnetization map. The regional scale 1:2,500,000 map mosaic is being digitized using previous magnetization models, the U.S. magnetic anomaly map, and regional tectonic maps as a guide. A.R.H.

N83-21453*# Geological Survey, Flagstaff, Ariz.

GEOMETRIC AND RADIOMETRIC CHARACTERIZATION OF LANDSAT-D THEMATIC MAPPER AND MULTISPECTRAL SCANNER DATA Status Report

Hugh Kieffer, Principal Investigator 18 Feb. 1983 6 p Sponsored by NASA ERTS

(E83-10212; NASA-CR-170058; NAS 1.26:170058) Avail: NTIS HC A02/MF A01 CSCL 05B

A geometrically raw image of Washington, D.C. was acquired and radiometrically corrected. The data show little of the detector stripping common in earlier MSS images. The radiometrically corrected data have uniform means and standard deviations for the detectors in each band; however, the data for different detectord utilize a different pattern of DN levels, resulting in ubiquitous stripping of 1 DN amplitude. Band-to-band registration was assessed using color composites and small area correlation techniques. The spectral equivalency of the first four bands of the thematic mapper with the four bands of the MSS is being examined. Geometric analysis of the Washington, D.C. scene have started and a generalized routine for examining the contents of the label files and nonvideo data files was implemented. Several discrepancies from the documentation are described. Night scenes and daytime ocean scenes required for radiometric purposes were identified and the data ordered. A.R.H.

N83-21454*# Agricultural Research Center, Beltsville, Md. Hydrology Lab.

INFORMATION CONTENT OF DATA FROM THE LANDSAT-4 THEMATIC MAPPER (TM) AND MULTISPECTRAL SCANNER (MSS) Progress Report

John C. Price [1983] 5 p ERTS

(NASA Order S-10772-C)

(E83-10213; NASA-CR-170072; NAS 1.26:170072; PR-1) Avail: NTIS HC A02/MF A01 CSCL 05B

Software was constructed to reformat data to band interlevel format and analysis software was developed in an effort to quantify the increased information content (statistical variability within a data set) of thematic mapper data as compared to that from the LANDSAT 4 multispectral band scanner. Computer runs were carried out for several subareas from a data set acquired simultaneously by TM and MSS over a test area in northeast

Arkansas, one of the most agriculturally diverse sea areas in the country. The 6 visible-near IR channels of the TM provide more information than the 4 channels of the MSS. A rough estimate of 20 bits per pixel for TM, and 10 bits per pixel for the MSS was computed for these subareas. These numbers are to be revised downward when allowance is made for noise in the data. A.R.H.

N83-21455*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.

INVENTORY AND ANALYSIS OF RANGELAND RESOURCES OF THE STATE LAND BLOCK ON PARKER MOUNTAIN, UTAH

Richard A. Jaynes, Principal Investigator 1983 153 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NAGw-95)
(E83-10214; NASA-CR-170073; NAS 1.26:170073; CRSC-82-6) Avail: NTIS HC A08/MF A01 CSCL 08B

High altitude color infrared (CIR) photography was interpreted to provide an 1:24,000 overlay to U.S.G.S. topographic maps. The inventory and analysis of rangeland resources was augmented by the digital analysis of LANDSAT MSS data. Available geology, soils, and precipitation maps were used to sort out areas of confusion on the CIR photography. The map overlay from photo interpretation was also prepared with reference to print maps developed from LANDSAT MSS data. The resulting map overlay has a high degree of interpretive and spatial accuracy. An unacceptable level of confusion between the several sagebrush types in the MSS mapping was largely corrected by introducing ancillary data. Boundaries from geology, soils, and precipitation maps, as well as field observations, were digitized and pixel classes were adjusted according to the location of pixels with particular spectral signatures with respect to such boundaries. The resulting map, with six major cover classes, has an overall accuracy of 89%. Overall accuracy was 74% when these six classes were expanded to 20 classes. A.R.H.

N83-21456*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

APPLICATION OF REMOTE SENSING DATA TO LAND USE AND LAND COVER ASSESSMENT IN THE TUBARAO RIVER COASTAL PLAIN, SANTA CATARINA, BRAZIL

Nelson de Jesus Parada, Principal Investigator and Dalton de Morisson Valeriano Nov. 1982 26 p refs Presented at the Intern. Symp. on Util. of Coastal Ecosystems: Planning, Pollution and Productivity, Rio Grande, Brazil, 22-27 Nov. 1982 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10215; NASA-CR-170074; NAS 1.26:170074;
INPE-2591-PRE/239) Avail: NTIS HC A03/MF A01 CSCL 08B

By means of aerial photography and MSS-LANDSAT data a land use/land cover classification was applied to the Tubarao River coastal plain. The following classes were identified: coal related areas, permanently flooded wetlands, periodically flooded wetlands, agricultural lands, bare soils, water bodies, urban areas, forestlands. Author

N83-21457*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

VERTICAL EDDY DIFFUSION COEFFICIENT FROM THE LANDSAT IMAGERY

Nelson de Jesus Parada, Principal Investigator, Y. Viswanadham, and J. A. Torsani Sep. 1982 24 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10216; NASA-CR-170075; NAS 1.26:170075;
INPE-2530-PRE/197) Avail: NTIS HC A02/MF A01 CSCL 08C

Analysis of five stable cases of the smoke plumes that originated in eastern Cabo Frio (22 deg 59'S; 42 deg 02'W), Brazil using LANDSAT imagery is presented for different months and years. From these images the lateral standard deviation (sigma sub y) and the lateral eddy diffusion coefficient (K sub y) are obtained from the formula based on Taylor's theory of diffusion by continuous moment. The rate of kinetic energy dissipation (e) is evaluated from the diffusion parameters sigma sub y and K sub y. Then, the vertical diffusion coefficient (K sub z) is estimated using Weinstock's formulation. These results agree well with the previous experimental values obtained over water surfaces by various workers. Values of e and K sub z show the weaker mixing processes in the marine stable boundary layer. The data sample is apparently to small to include representative active turbulent regions because such regions are so intermittent in time and in space. These results form a data base for use in the development and validation of mesoscale atmospheric diffusion models. M.G.

N83-21458*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ENHANCEMENT OF DIGITAL IMAGES THROUGH BAND RATIO TECHNIQUES FOR GEOLOGICAL APPLICATIONS

Nelson de Jesus Parada, Principal Investigator, Raimundo Almeida Filho, and Icaro Vitorello Dec. 1982 23 p refs Presented at the COGEODATA-IAMG Meeting for South Am., Rio de Janeiro, 14-17 Dec. 1981 Sponsored by NASA ERTS
(E83-10217; NASA-CR-170076; NAS 1.26:170076;
INPE-2604-PRE/250) Avail: NTIS HC A02/MF A01 CSCL 05B

The fundamentals in the use of band ratio techniques to enhance spectral signatures of geologic interest are discussed. The path radiance, additive term of the measured radiance at any given wavelength, is almost completely eliminated from LANDSAT images by subtracting the smallest value of the radiance measured in each channel, at shadows caused by topographic relief and clouds, and deep clear water bodies. By ratioing successive spectral channels the effect of solar angle of elevation is minimized and the product expresses, to a first approximation, a relationship between reflectances, which are intrinsic characteristics of the targets. Ratios between noncorrelated channels, such as R 7/4, R 7/5, and R 6/4 are useful to show variations in the vegetation cover, probably related to geobotanical associations. M.G.

N83-21459*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A PROCEDURE FOR TESTING THE QUALITY OF LANDSAT ATMOSPHERIC CORRECTION ALGORITHMS

Nelson de Jesus Parada, Principal Investigator, Luiz Alberto Vieira Dias, Nandamudi L. Vijaykumar, and Gilberto Camara Neto Nov. 1982 10 p refs Presented at the Remote Sensing Symp., Liverpool Sponsored by NASA ERTS
(E83-10218; NASA-CR-17077; NAS 1.26:17077;
INPE-2563-PRE/213) Avail: NTIS HC A02/MF A01 CSCL 05B

There are two basic methods for testing the quality of an algorithm to minimize atmospheric effects on LANDSAT imagery: (1) test the results a posteriori, using ground truth or control points; (2) use a method based on image data plus estimation of additional ground and/or atmospheric parameters. A procedure based on the second method is described. In order to select the parameters, initially the image contrast is examined for a series of parameter combinations. The contrast improves for better corrections. In addition the correlation coefficient between two subimages, taken at different times, of the same scene is used for parameter's selection. The regions to be correlated should not have changed considerably in time. A few examples using this proposed procedure are presented. M.G.

N83-21460*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

YIELD MODEL DEVELOPMENT PROJECT IMPLEMENTATION PLAN

Russell A. Ambroziak 15 Sep. 1982 100 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E83-10219; NASA-TM-85262; YM-U2-C0655; JSC-18564; NAS 1.15:85262) Avail: NTIS HC A05/MF A01 CSCL 02C

Tasks remaining to be completed are summarized for the following major project elements: (1) evaluation of crop yield

models; (2) crop yield model research and development; (3) data acquisition processing, and storage; (4) related yield research: defining spectral and/or remote sensing data requirements; developing input for driving and testing crop growth/yield models; real time testing of wheat plant process models) and (5) project management and support. A.R.H.

N83-21461*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF LANDSAT-4 TM AND MSS GROUND SEGMENT GEOMETRY PERFORMANCE WITHOUT GROUND CONTROL Quarterly Progress Report
9 Mar. 1983 3 p Sponsored by NASA ERTS
(E83-10220; NASA-CR-170078; NAS 1.26:170078) Avail: NTIS HC A02/MF A01 CSCL 05B

The along-line one dimensional FFT algorithm was successfully used to test band-to-band, swath-to-swath, and inter-swath registration of a Washington, D.C. scene. Analysis of the tabulated and plotted results of the MSS and TM P-data shows that a slow spacecraft roll condition of under one hertz exists in this scene. Characteristics of the data for both instruments are listed. A.R.H.

N83-21462*# Research Triangle Inst., Research Triangle Park, N.C. Office of Geosciences Programs.
MARINE APPLICATIONS OF HCMM SATELLITE DATA Final Report
Fred M. Vukovich Oct. 1982 21 p HCMM
(NASA Order S-97807-B)
(E83-10221; NASA-CR-170079; NAS 1.26:170079) Avail: NTIS HC A02/MF A01 CSCL 08C

Results of a limited comparison of HCMM sea surface temperature data with in situ data suggest that the HCMM data can provide a rather accurate representation of the sea surface temperature and temperature pattern. In the Nantucket Shoals region, the HCMM analysis provided data on the surface heating and on transport south of Nantucket Island and Nantucket Sound. The analyses also revealed the sea surface temperature structure of an anticyclonic warm ring. Author

N83-21463*# California Univ., Berkeley. Space Sciences Lab.
REMOTE SENSING RESEARCH FOR AGRICULTURAL APPLICATIONS Semiannual Progress Report, 1 Aug. 1982 - 31 Jan. 1983
Robert N. Colwell, Principal Investigator 31 Jan. 1983 13 p ERTS
(Contract NCC2-205)
(E83-10222; NASA-CR-170080; NAS 1.26:170080) Avail: NTIS HC A02/MF A01 CSCL 02C

The thematic mapper simulator (TMS) flown by the U-2/ER-2 aircraft is being used as a surrogate for LANDSAT-4TM data. Progress is reported on spectral data acquisition including TMS, color infrared high altitude aerial photography, and LANDSAT 3 MSS and ground data collection to support classification and testing. A test site in San Joaquin County was selected for analysis. A.R.H.

N83-21464*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.
IDENTIFYING ENVIRONMENTAL FEATURES FOR LAND MANAGEMENT DECISIONS Semiannual Report
11 Mar. 1982 31 p ERTS
(Grant NAGw-95)
(E83-10223; NASA-CR-170081; NAS 1.26:170081) Avail: NTIS HC A03/MF A01 CSCL 08B

The major accomplishments of the Center for Remote Sensing and Cartography are outlined. The analysis and inventory of the Parker Mountain rangeland and the use of multitemporal data to study aspen succession stages are discussed. New and continuing projects are also described including a Salt Lake County land use study, Wasatch-Cache riparian study, and Humboldt River riparian habitat study. Finally, progress in digital processing techniques is reported. M.G.

N83-21465*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SCROUNGE DATA PROCESSING FILM PRODUCTS FOR THE THEMATIC MAPPER
[1983] 8 p ERTS
(E83-10224; NASA-TM-85263; NAS 1.15:85263) Avail: NTIS HC A02/MF A01 CSCL 05B

Information on the format of the film product and type of film used for the LANDSAT-4 scrounge processed thematic mapper data is presented. Image gray scale, annotation field, and general layout are described. M.G.

N83-21466*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LGSOWG CCT FORMAT CCB DOCUMENT: THE STANDARD CCT FAMILY OF TAPE FORMATS
28 Aug. 1979 91 p ERTS
(E83-10225; NASA-TM-85264; NAS 1.15:85264; CCB-CCT-0002D) Avail: NTIS HC A05/MF A01 CSCL 05B

The tape format standardization approach recommended by the committee on CCT standardization is described and defined. All rules and conventions required to employ the superstructure approach to the CCT family of tape formats are presented for users of remote sensing data and producer of user tapes and the superstructure records are specified. The standard for future tape format design is presented as a guide to designing data records of a particular tape format. An example is provided showing how to incorporate the superstructure into an already established tape format. A.R.H.

N83-21467*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 MULTISPECTRAL SCANNER (MSS) SUBSYSTEM RADIOMETRIC CHARACTERIZATION
W. Alford, ed., J. Barker, ed., B. P. Clark, and R. Dasgupta Feb. 1983 77 p Prepared by Computer Sciences Corp., Silver Spring, Md. ERTS
(E83-10226; NASA-TM-85265; Rept-435-D-404; NAS 1.15:85265) Avail: NTIS HC A05/MF A01 CSCL 14B

The multispectral band scanner (mass) and its spectral characteristics are described and methods are given for relating video digital levels on computer compatible tapes to radiance into the sensor. Topics covered include prelaunch calibration procedures and postlaunch radiometric processng. Examples of current data resident on the MSS image processing system are included. The MSS on LANDSAT 4 is compared with the scanners on earlier LANDSAT satellites. A.R.H.

N83-21468*# EROS Data Center, Sioux Falls, S. Dak.
LANDSAT MULTISPECTRAL SCANNER COMPUTER-COMPATIBLE TAPE FORMAT, VERSION 1.0
1982 151 p Sponsored by NASA ERTS
(E83-10227; NASA-CR-170082; NAS 1.26:170082) Avail: NTIS HC A08/MF A01 CSCL 05B

Unlike previous LANDSAT computer compatible tape (CCT) formats, the standard format of CCT's now includes a comprehensive field location and data description information superstructure composed of four records. The volume descriptor record, the text record, and the file pointer record reside in a volume directory file, which generally describes the data configuration and provides pointers to each data file. The file descriptor record for each data file describes the data structure within the file and provides pointers to certain fields within the file. These superstructure records primarily supply information about the data on the CCT as opposed to carrying the data themselves. The EROS Data Center's LANDSAT CCT version 1.0 product is presented which conforms to the concepts of the standard format as much as is possible with existing EDC systems. A.R.H.

N83-21469*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS NOTICE FOR PARTICIPATION IN THE LANDSAT-D IMAGE DATA QUALITY ANALYSIS PROGRAM

23 Oct. 1981 57 p ERTS
(E83-10228; NASA-TM-85266; NAS 1.15:85266) Avail: NTIS HC A04/MF A01 CSCL 05B

The applications notice for the LANDSAT 4 image data quality analysis program is presented. The objectives of the program are to qualify LANDSAT 4 sensor and systems performance from a user applications point of view, and to identify any malfunctions that may impact data applications. Guidelines for preparing proposals and background information are provided. M.G.

N83-21470*# National Aeronautics and Space Administration, Washington, D. C.
LANDSAT-D ASSESSMENT SYSTEM LIBRARY COMPUTER COMPATIBLE TAPE (LASLIB-CCT/LAS-CCT)
Jun. 1982 54 p refs ERTS
(E83-10229; NASA-TM-85267; NAS 1.15:85267) Avail: NTIS HC A04/MF A01 CSCL 05B

The format for computer compatible tapes containing thematic mapper archival data and product data generated by the LANDSAT-D Assessment System (LAS). These data tapes are engineering products developed primarily for LAS internal use to assist in the early evaluation of thematic mapper data quality and ground data processing algorithms during the limited period of one year following the launch of LANDSAT-D. M.G.

N83-21471*# National Aeronautics and Space Administration, Washington, D. C.
LANDSAT-D PROJECT ADDS/LAS. SCROUNGE INTERFACE CONTROL DOCUMENT
8 Feb. 1982 20 p ERTS
(E83-10230; NASA-TM-85268; NAS 1.15:85268) Avail: NTIS HC A02/MF A01 CSCL 05B

The content and format of all data to be exchanged between the Applications Developmental data System (ADDS) and the LANDSAT-D Assessment System (LAS) for satisfaction of early access thematic mapper product generation requirements is specified. The ADDS provides partially processed TM data tapes on CCT's. The LANDSAT-D Assessment System processes the TM data to fully processed data tapes on 6250 bpi computer compatible tapes and provides required film data products. M.G.

N83-21472*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT 4 TO GROUND STATION INTERFACE DESCRIPTION
Aug. 1982 160 p Revised ERTS
(E83-10213; NASA-TM-85269; NAS 1.15:85269) Avail: NTIS HC A08/MF A01 CSCL 12B

The radiometric requirements, internal calibration, sensor output format, geometric characteristics, and data processing constants for the LANDSAT 4 multispectral scanner and thematic mapper are described. In addition, telemetry format, onboard computer reports, and LANDSAT 4 communications are discussed. M.G.

N83-21473*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-D MISSION OPERATIONS REVIEW (MOR)
1982 276 p Review held at Goddard Space Flight Center, Greenbelt, Md., 6-7 Apr. 1982 ERTS
(E83-10232; NASA-TM-85270; NAS 1.15:85270) Avail: NTIS HC A13/MF A01 CSCL 05A

The integrated LANDSAT-D systems operation plan is presented and discussed with respect to functional elements, personnel, and procedures. Specifically, a review of the LANDSAT-D program, mission requirements and management, and flight operations is given. M.G.

N83-21474*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-D MISSION OPERATIONS REVIEW (MOR)
1982 254 p Review held at Goddard Space Flight Center, Greenbelt, Md., 6-7 Apr. 1982 ERTS
(E83-10233; NASA-TM-85271; NAS 1.15:85271) Avail: NTIS HC A12/MF A01 CSCL 05A

Portions of the LANDSAT-D systems operation plan are presented. An overview of the data processing operations, logistics and other operations support, prelaunch and post-launch activities, thematic mapper operations during the scrounge period, and LANDSAT-D performance evaluation is given. M.G.

N83-21475*# General Electric Co., Lanham, Md. Space Div.
LANDSAT-D ACCELERATED PAYLOAD CORRECTION SUBSYSTEM OUTPUT COMPUTER COMPATIBLE TAPE FORMAT
17 Feb. 1982 68 p ERTS
(Contract NAS5-15300)
(E83-10234; NASA-CR-170085; NAS 1.26:170085; PIR-U-1T80-LSD-MMF-124-Rev-A) Avail: NTIS HC A04/MF A01 CSCL 05B

The NASA GSFC LANDSAT-D Ground Segment (GS) is developing an Accelerated Payload Correction Subsystem (APCS) to provide Thematic Mapper (TM) image correction data to be used outside the GS. This correction data is computed from a subset of the TM Payload Correction Data (PCD), which is downlinked from the spacecraft in a 32 Kbps data stream, and mirror scan correction data (MSCD), which is extracted from the wideband video data. This correction data is generated in the GS Thematic Mapper Mission Management Facility (MMF-T), and is recorded on a 9-track 1600 bit per inch computer compatible tape (CCT). This CCT is known as a APCS Output CCT (AOT). The AOT follows standardized corrections with respect to data formats, record construction and record identification. Applicable documents are delineated; common conventions which are used in further defining the structure, format and content of the AOT are defined; and the structure and content of the AOT are described. A.R.H.

N83-21476*# Earth Satellite Corp., Chevy Chase, Md.
STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION Quarterly Progress Report, 7 Oct. 1982 - 7 Jan. 1983
John R. Everett, Principal Investigator 7 Jan. 1983 5 p ERTS
(Contract NAS5-17384)
(E83-10235; NASA-CR-170086; NAS 1.26:170086; QR-1) Avail: NTIS HC A02/MF A01 CSCL 05B

Two fully processed test tapes were enhanced and evaluated at scales up to 1:10,000, using both hardcopy output and interactive screen display. A large scale, the Detroit, Michigan scene shows evidence of an along line data slip every sixteenth line in TM channel 2. Very large scale products generated in false color using channels 1,3, and 4 should be very acceptable for interpretation at scales up to 1:50,000 and useful for change mapping probably up to scale 1:24,000. Striping visible in water bodies for both natural and color products indicates that the detector calibration is probably performing below preflight specification. For a set of 512 x 512 windows within the NE Arkansas scene, the variance-covariance matrices were computed and principal component analyses performed. Initial analysis suggests that the shortwave infrared TM 5 and 6 channels are a highly significant data source. The thermal channel (TM 7) shows negative correlation with TM 1 and 4. A.R.H.

N83-21477*# General Electric Co., Lanham, Md. Space Div.
LANDSAT-D DATA FORMAT CONTROL BOOK. VOLUME 6, APPENDIX A: PARTIALLY PROCESSED THEMATIC MAPPER HIGH DENSITY TAPE (HDT-AT)
A. Jai 11 Jun. 1982 148 p ERTS
(Contract NAS5-25300)
(E83-10236; NASA-CR-170087; NAS 1.26:170087; GES-10033-Vol-6-App-A-Rev-B) Avail: NTIS HC A07/MF A01 CSCL 05B

One of the outputs of the data management system being developed to provide a variety of standard image products from the thematic mapper and the multispectral band scanners on LANDSAT 4, is the partially processed TM data (radiometric corrections applied and geometric correction matrices for two projections appended) which is recorded on a 28-track high density

tape. Specifications are presented for the format of the recorded data as well as for the time code and the major and minor frames of the tape. Major frame types, formats, and field definitions are included. A.R.H.

N83-21478*# General Electric Co., Lanham, Md. Space Div.
LANDSAT-D DATA FORMAT CONTROL BOOK. VOLUME 6, APPENDIX D: THEMATIC MAPPER COMPUTER COMPATIBLE TAPE (CCT-AT/PT)
H. Ahmed 21 Oct. 1981 163 p ERTS
(Contract NAS5-25300)
(E83-10237; NASA-CR-170088; NAS 1.26:170088; GES-10490) Avail: NTIS HC A08/MF A01 CSCL 05B

The format of computer compatible tapes which contain LANDSAT 4 and D Prime thematic mapper data is defined. A complete specification of the CCT-AT (radiometric corrections applied and geometric matrices appended) and the CCT-PT (radiometric and geometric corrections) data formats is provided. M.G.

N83-21479*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-4 WORLD REFERENCE SYSTEM (WRS) USERS GUIDE
Oct. 1982 293 p refs ERTS
(E83-10238; NASA-TM-85284; NAS 1.15::85284) Avail: NTIS HC A13/MF A01 CSCL 05B

A functional description of the new LANDSAT-4 World Reference System (WRS) with an overview of the main orbital parameters and instrument coverages is presented to provide the data user with the primary information required to understand LANDSAT-4 orbital characteristics, to effectively use the WRS indexing scheme, and to request specific geographic coverage on the desired observation dates. A.R.H.

N83-21480*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERFACE CONTROL DOCUMENT BETWEEN THE NASA GODDARD SPACE FLIGHT CENTER (GSFC) AND DEPARTMENT OF INTERIOR EROS DATA CENTER (EDC) FOR LANDSAT-D. THEMATIC MAPPER HIGH RESOLUTION 241 MM FILM
4 Jan. 1982 33 p ERTS
(E83-10239; NASA-TM-85272; LSD-ICD-801; NAS 1.15:85272) Avail: NTIS HC A03/MF A01 CSCL 05B

The 241 mm photographic product produced by the Goddard Space Flight Center Data Management System for LANDSAT-D is described. Film type and format, image dimensions, frame ID, gray scale, resolution patterns, registration marks, etc. are addressed. M.G.

N83-21481*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERFACE CONTROL DOCUMENT BETWEEN THE NASA GODDARD SPACE FLIGHT CENTER (GSFC) AND DEPARTMENT OF INTERIOR EROS DATA CENTER (EDC) FOR LANDSAT-D. PARTIALLY PROCESSED MULTISPECTRAL SCANNER HIGH DENSITY TAPE (HDT-AM)
4 Jan. 1982 84 p ERTS
(E83-10240; NASA-TM-85273; LSD-ICD-201; NAS 1.15:85273) Avail: NTIS HC A05/MF A01 CSCL 05B

The format of the HDT-AM product which contains partially processed LANDSAT D and D Prime multispectral scanner image data is defined. Recorded-data formats, tape format, and major frame types are described. M.G.

N83-21482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-D INVESTIGATIONS WORKSHOP
1982 266 p Workshop held at Goddard Space Flight Center, Greenbelt, Md., 13-14 May 1982 ERTS
(E83-10241; NASA-TM-85274; NAS 1.15:85274) Avail: NTIS HC A12/MF A01 CSCL 05A

Viewgraphs are presented which highlight LANDSAT-D project status and ground segment; early access TM processing; LANDSAT-D data acquisition and availability; LANDSAT-D performance characterization; MSS pre-NOAA characterization; MSS radiometric sensor performance (spectral information, absolute calibration, and ground processing); MSS geometric sensor performance; and MSS geometric processing and calibration. A.R.H.

N83-21483*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LANDSAT-D INVESTIGATIONS WORKSHOP
1982 265 p Workshop held at Goddard Space Flight Center, Greenbelt, Md., 13-14 May 1982 ERTS
(E83-10242; NASA-TM-85275; NAS 1.15:85275) Avail: NTIS HC A12/MF A01 CSCL 05A

The objectives and methods used to determine the performance of the LANDSAT-D thematic mapper radiometric and geometric sensors are depicted in graphs and charts. Other aspects illustrated include ground and flight segment TM geometric processing and early access TM processing. A.R.H.

N83-21484*# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, 1 Oct. - 31 Dec. 1982
David A. Hastings, Principal Investigator 31 Dec. 1982 6 p Sponsored by NASA ERTS
(Contract DI-14-08-0001-20129)
(E83-10243; NASA-CR-170090; NAS 1.26:170090) Avail: NTIS HC A02/MF A01 CSCL 05B

Both MAGSAT data and preliminary results emphasizing Africa, Latin America, and the Caribbean were presented to geologists in Jamaica, Guyana, Brazil, and Argentina. Preliminary interpretations were discussed. A synopsis tectonic map of South America was completed. Semi-final modeling of northern South America was initiated. A.R.H.

N83-21485*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REMOTE SENSING OF ICE PHENOMENA FROM ORBIT BY SIGNAL CORRELATION OF MULTIPLE RECEIVER RESPONSES
J. M. Stacey and E. J. Johnston 1 Jan. 1983 18 p refs
(NASA-CR-170122; NAS 1.26:170122; JPL-Publ-83-3) Avail: NTIS HC A02/MF A01 CSCL 08L

The method of signal correlation of microwave responses as applied to the measurement of Earth-surface ice temperatures from orbit is explained and summarized. Ice temperatures are estimated by a correlation function that is derived from the processes of a forward stepwise correlator. Subsets of the post-detected outputs of microwave receiving channels are combined in a multivariate cross-correlation function which operates as a spatial filter and serves to improve the spatial resolution of the thermal gradients in ice structures. The correlator is designed to selectively identify the correlative components among the microwave responses and to strongly suppress or cancel the non-correlative components appearing in the post-detected outputs. Author

N83-21486*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL DYNAMICS PROJECT SESSION 4 VALIDATION AND INTERCOMPARISON EXPERIMENTS 1979-1980 REPORT
Phil Liebrecht, Ron Kolenkiewicz, Jim Ryan, and Larry Hothem Mar. 1983 97 p refs
(NASA-TM-85003; NAS 1.15:85003) Avail: NTIS HC A05/MF A01 CSCL 08E

As part of the Crustal Dynamics Project, an experiment was performed to verify the ability of Satellite Laser Ranging (SLR), Very Long Baseline interferometry (VLBI) and Doppler Satellite Positioning System (Doppler) techniques to estimate the baseline

distances between several locations. The Goddard Space Flight Center (GSFC) lasers were in operation at all five sites available to them. The ten baselines involved were analyzed using monthly orbits and various methods of selecting data. The standard deviation of the monthly SLR baseline lengths was at the 7 cm level. The GSFC VLBI (Mark III) data was obtained during three separate experiments. November 1979 at Haystack and Owens Valley, and April and July 1980 at Haystack, Owens Valley, and Fort Davis. Repeatability of the VLBI in determining baseline lengths was calculated to be at the 2 cm level. Jet Propulsion Laboratory (JPL) VLBI (Mark II) data was acquired on the Owens Valley to Goldstone baseline on ten occasions between August 1979 and November 1980. The repeatability of these baseline length determinations was calculated to be at the 5 cm level. National Geodetic Survey (NGS) Doppler data was acquired at all five sites in January 1980. Repeatability of the Doppler determined baseline lengths results were calculated at approximately 30 cm. An intercomparison between baseline distances and associated parameters was made utilizing SLR, VLBI, and Doppler results on all available baselines. The VLBI and SLR length determinations were compared on four baselines with a resultant mean difference of -1 cm and a maximum difference of 12 cm. The SLR and Doppler length determinations were compared on ten baselines with a resultant mean difference of about 30 cm and a maximum difference of about 60 cm. The VLBI and Doppler lengths from seven baselines showed a resultant mean difference of about 30 cm and maximum difference of about 1 meter. The intercomparison of baseline orientation parameters were consistent with past analysis. Author

N83-21487*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AUTOMATED BASIN DELINEATION FROM DIGITAL TERRAIN DATA

Danny Marks, Jeff Dozier, and James Frew Jan. 1983 21 p refs Prepared in cooperation with California Univ., Santa Barbara (Grants NGT-05-010-801; NOAA-NA81-AA-D-00063)
(NASA-TM-84984; NAS 1.15:84984) Avail: NTIS HC A02/MF A01 CSCL 08B

While digital terrain grids are now in wide use, accurate delineation of drainage basins from these data is difficult to efficiently automate. A recursive order N solution to this problem is presented. The algorithm is fast because no point in the basin is checked more than once, and no points outside the basin are considered. Two applications for terrain analysis and one for remote sensing are given to illustrate the method, on a basin with high relief in the Sierra Nevada. This technique for automated basin delineation will enhance the utility of digital terrain analysis for hydrologic modeling and remote sensing. B.W.

N83-21488*# Geogroup, Berkeley, Calif.

OPERATIONAL ALTERNATIVES FOR LANDSAT IN CALIFORNIA Annual Report

Paul Wilson and M. J. Gialdini Jul. 1981 80 p refs
(Contract NAS2-11099)
(NASA-CR-166353; NAS 1.26:166353) Avail: NTIS HC A05/MF A01 CSCL 08B

A number of methods were developed which use the computer as a tool for the compilation and analysis of resource data. These systems typically include storage of mapped data in a form usable by the computer, a way of performing analytical operations on the data, and a way of translating results into human-readable form. Many organizations with responsibility for the planning of management of a defined geographic area have developed this kind of system. S.L.

N83-21489# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

BERING STRAIT SEA ICE AND THE FAIRWAY ROCK ICEFOOT

Austin Kovacs, Devinder S. Sodhi, and Gordon F. N. Cox Oct. 1982 47 p refs
(AD-A122477; CRREL-82-31) Avail: NTIS HC A03/MF A01 CSCL 08/12

Information on sea ice conditions in the Bering Strait and the icefoot formation around Fairway Rock, located in the strait, is presented. Cross-sectional profiles of Fairway Rock and the relief of the icefoot are given along with theoretical analyses of the possible forces active during icefoot formation. It is shown that the ice cover most likely fails in flexure as opposed to crushing or buckling, as the former requires less force. Field observations reveal that the Fairway Rock icefoot is massive, with ridges up to 15 m high, a seaward face only 20 degrees from vertical, and interior ridge slopes averaging 33 degrees. The icefoot is believed to be grounded and its width ranges from less than 10 to over 100 m. GRA

N83-21490# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Snow and Ice Branch.

ON THE DIFFERENCES IN ABLATION SEASONS OF ARCTIC AND ANTARCTIC SEA ICE

Edgar L. Andreas and Stephen F. Ackley Oct. 1982 16 p refs (Grant NSF DPP-80-06922; DA Proj. 4A1-61102-AT-24)
(AD-A122454; CRREL-82-33) Avail: NTIS HC A02/MF A01 CSCL 08/12

Arctic sea ice is freckled with melt ponds during the ablation season; Antarctic sea ice has few, if any. On the basis of a simple surface heat budget, we investigate the meteorological conditions necessary for the onset of surface melting in an attempt to explain these observations. The low relative humidity associated with the relatively dry winds off the continent and an effective radiation parameter smaller than that characteristic of the Arctic are primarily responsible for the absence of melt features in the Antarctic. Together these require a surface-layer air temperature above 0 C before Antarctic sea ice can melt. A ratio of the bulk transfer coefficients C sub H/C sub E less than 1 also contributes to the dissimilarity in Arctic and Antarctic ablation seasons. The effects of wind speed and of the sea-ice roughness on the absolute values of C sub H and C sub E seem to moderate regional differences, but final assessment of this hypothesis awaits better data, especially from the Antarctic. Author (GRA)

N83-21491# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Earth Sciences Branch.

HYDROLOGY AND CLIMATOLOGY OF THE CARIBOU-POKER CREEKS RESEARCH WATERSHED, ALASKA

Richard K. Haugen, Charles W. Slaughter (U.S. Forest Service), Karen E. Howe, and S. Lawrence Dingman (New Hampshire Univ.) Oct. 1982 43 p refs
(AD-A122402; CRREL-82-26) Avail: NTIS HC A03/MF A01 CSCL 08/8

The Caribou-Poker creeks research watershed is a small (101.5-sq km) drainage basin located 48 km northwest of Fairbanks, Alaska. Elevations within the watershed range from 210 to 826 m, and approximately 28% of its area is underlain by permafrost. Climatic differences between the watershed and Fairbanks are primarily due to the higher elevation of the watershed. Generally the watershed climatic sites are warmer in winter and cooler in summer than Fairbanks. Within the watershed the greatest temperature contrasts exist in winter, when the valley bottom sites are beneath the regional air temperature inversion, and the higher sites are above it. From May through September the total precipitation averages 270 mm, 1.47 times that received at Fairbanks. The annual precipitation is about 1.7 times that of Fairbanks. The historical precipitation record at Fairbanks indicates that summer precipitation was below the long term normal in 8 of the 11 years of watershed measurements (1969-1980); no climatic extremes occurred during this period. An analysis of annual streamflow data showed an inconsistency of baseflow recessions from year to year. The runoff rainfall ratio for individual summer storms averaged 0.35 for Caribou Creek. Comparisons of spot discharge measurements of predominantly permafrost and nonpermafrost subwatersheds showed that permafrost dominated watersheds have a much flashier response to precipitation than nonpermafrost watersheds. A comparison of the annual flow distribution of the watershed indicated that Caribou Creek has

lower summer and higher winter discharges per unit area than the Chena or Salcha Rivers. GRA

N83-21492# Soil Conservation Service, Columbia, Mo.
GREAT 3 EROSION AND SEDIMENT INVENTORY. SAVERTON, MISSOURI TO CAIRO, ILLINOIS Final Report
Jun. 1982 185 p refs
(Contract DACW43-81-C-0071)
(AD-A122630) Avail: NTIS HC A09/MF A01 CSCL 08/8

Erosion and sediment data for the Mississippi River and for 12 adjacent Water Resource Hydrologic Units from Saverton, Missouri, to Cairo, Illinois, were gathered and analyzed. At present, an estimated 115 million tons of sediment on the average annually passes by St. Louis, Missouri. In statistical analyses of suspended sediment concentrations at Hermann, Missouri, and Hannibal, Missouri, only 50 percent of the annual variation in sediment concentration could be explained by discharge. Untreated and treated analyses for grain size determinations of suspended sediment taken from the Missouri and Mississippi Rivers were significantly different. Specific surface area of sediment samples ranged from 87 to 203 square meters per gram. Surface area determinations using ethylene glycol monoethyl ether (EGME) were not significantly different for treated samples vs. native water samples. Aggregate size distribution measured from native water samples is not useful in computing surface area. Of four chemicals added during water treatment at the St. Louis, Missouri, and Alton, Illinois, water treatment plants to facilitate filtering and settling or impurities, only ferric sulfate correlated with suspended solids. GRA

N83-21493# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: BUCKSHOT, TEXAS Final Report
1982 536 p Prepared in cooperation with QEB, Inc., Lakewood, Colo. 2 Vol.
(Contract DE-AC13-79GJ-01692)
(DE83-002724; GJBX-196-82-Vol-2D) Avail: NTIS HC A23/MF A01

Radiometric contour maps, magnetic contour maps, and multi-variant analysis maps for an airborne gamma ray spectrometer and magnetometer survey of an area of Texas are given. DOE

N83-21494# Argonne National Lab., Ill. Land Reclamantion Program.
ALASKAN COAL: RESOURCES AND DEVELOPMENTAL CONSTRAINTS
Dorland E. Edgar, Lawrence J. Onesti (Indiana Univ.), and Gary M. Kaszynski (ESCOR, Inc.) Mar. 1982 139 p refs
(Contract W-31-109-eng-38)
(DE83-000860; ANL/LRP-18) Avail: NTIS HC A07/MF A01

Exploration of coal deposits in Alaska which may be as much coal as found in all of the 48 conterminous states is discussed. Most of the coal deposits are located in the North Slope Basin and associated strata extending beneath the Chukchi Sea, the Nenana Basin of the interior, and the Cook Inlet Basin in the south. Most Alaskan coal is subbituminous to bituminous with relatively high moisture and ash content, moderate heat value, and very low sulfur content; may deposits are well suited for surface mining. It is anticipated that mining will increase dramatically in the next few years in response to a developing Far East market. Near term increases in production will probably come from the existing mine and from new mines in the interior and south central regions of the state. There is limited experience in Alaskan surface coal mining and reclamation and it is recommended that research be conducted to develop cost effective mining and reclamation technologies that minimize or prevent adverse impacts on Alaska's unique ecosystems. DOE

N83-21495# Sandia Labs., Albuquerque, N. Mex.
MODULAR AIRBORNE REMOTE SAMPLING AND SENSING SYSTEM (MARSSS)
R. O. Woods Apr. 1982 20 p Presented at the APCA Specialty Conf., San Diego, Calif., 18-21 Jan. 1982
(Contract DE-AC04-76DP-00789)
(DE82-014657; SAND-81-1522) Avail: NTIS HC A02/MF A01

Sandia is developing a modular airborne instrumentation system for the Environmental Protection Agency. This system will allow flexibility in the choice of instruments by standardizing mountings, power supplies and sampling modes. The objective is to make it possible to perform aerial surveys from chartered aircraft that have not been adapted in a more than superficial manner. It will also allow the experimenter to tailor his choice of instruments to the specific problem. Since the equipment will have a stand alone capability, it can be applied to other problems such as long term unattended use at remote locations or in toxic or otherwise hazardous environments. DOE

N83-21496# Los Alamos Scientific Lab., N. Mex.
GEOTHERMAL DATA FOR 95 THERMAL AND NONTHERMAL WATERS OF THE VALLES CALDERA, SOUTHERN JEMEZ MOUNTAINS REGION, NEW MEXICO
F. Goff, Trujillo P. E. McCormick, Jr., D. Counce, and C. O. Grigsby May 1982 55 p refs
(Contract W-7405-eng-36)
(DE82-017397; LA-9367-OBES) Avail: NTIS HC A04/MF A01

Field, chemical, and isotopic data for 95 thermal and nonthermal waters of the southern Jemez Mountains, New Mexico are presented. This region includes all thermal and mineral waters associated with Valles Caldera and many of those located near the Nacimiento Uplift, near San Ysidro. Waters of the region can be categorized into five general types: surface and near surface meteoric waters; acid sulfate waters (Valles Caldera); thermal meteoric waters (Valles Caldera); and mineralized waters near San Ysidro. Some waters display chemical and isotopic characteristics intermediate between the types listed. The object of the data is to help interpret geothermal potential of the Jemez Mountains region and to provide background data for investigating problems in hydrology, structural geology, hydrothermal alterations, and hydrothermal solution chemistry. DOE

N83-21497# Los Alamos Scientific Lab., N. Mex.
EVALUATION OF INTEGRATED DATA SETS. FOUR EXAMPLES
Stephen L. Bolivar, Susan Balog Freeman, and Thomas A. Weaver 1982 21 p refs Presented at the Math. Geol. US Symp., Golden, Colo., 27 Jan. 1982 Submitted for publication
(Contract W-7405-eng-36)
(DE82-012131; LA-UR-82-859; CONF-820146-1) Avail: NTIS HC A02/MF A01

Several large data sets have been integrated and utilized for rapid evaluation on a reconnaissance scale for the Montrose 1 deg x 2 deg quadrangle, Colorado. The data sets include LANDSAT imagery, hydrogeochemical and stream sediment analyses, airborne geophysical data, known mineral occurrences, and a geologic map. All data sets were registered to a 179 x 199 rectangular grid and projected onto Universal Transverse Mercator coordinates. A grid resolution of 1 km was used. All possible combinations of three, for most data sets, were examined for general geologic correlations by utilizing a color microfilm output. In addition, gray level pictures of statistical output, e.g., factor analysis, have been employed to aid evaluations. Examples for the data sets dysprosium calcium, lead copper zinc, and equivalent uranium-uranium in water-uranium in sediment are described with respect to geologic applications, base metal regimes, and geochemical associations. DOE

N83-21498# Bendix Field Engineering Corp., Grand Junction, Colo.
STATISTICAL TECHNIQUES APPLIED TO AERIAL RADIOMETRIC SURVEYS (STAARS): CLUSTER ANALYSIS
Fredric L. Pirkle, Newton K. Stablein, Jo Ann Howell (LASL, N. Mex.), George W. Wecksung (LASL, N. Mex.), and Benjamin S. Duran (Texas Technological Univ.) Nov. 1982 39 p refs
(Contracts W-7405-eng-36; DE-AC07-76GJ-01664)
(DE83-004397; GJBX-202(82)) Avail: NTIS HC A03/MF A01

It is shown that cluster analysis can identify groups with similar radiometric values even when no a priori knowledge of the geology of an area exists. A method of convergent k-means cluster

analysis coupled with a hierarchical cluster analysis is used to classify 6691 observations (three radiometric variables at each observation location) from the Precambrian rocks of the Copper Mountain, Wyoming, area. Another method, one that combines a principal components analysis with a convergent k-means analysis, is applied to the same data. These two methods are compared with a convergent k-means analysis that utilizes available geologic knowledge. All three methods identify four clusters. Three of the clusters represent background values for the Precambrian rocks of the area, and one represents outliers (anomalously high (214)Bi). A segmentation of the data corresponding to geologic reality as discovered by other methods was achieved based solely on analysis of aerial radiometric data. The techniques employed are composites of classical clustering methods designed to handle the special problems presented by large data sets. DOE

N83-21499# International Inst. for Applied Systems Analysis, Laxenburg (Austria).
A REVIEW OF WORLD HYDROCARBON RESOURCE ASSESSMENTS Final Report
M. Grenon Nov. 1982 161 p refs Sponsored by EPRI
(DE83-900732; EPRI-EA-2658) Avail: NTIS HC A08/MF A01

Past assessments of world oil, natural gas, and oil-shale resources are reviewed. It identifies the methods used in making these assessments (historical statistics, geological analogy, engineering, and probabilistic), the geographical coverage, the time horizons, and the major assumptions about such factors as discovery rates, and recovery factor. The period covered extends from the end of World War II to the end of 1980. Conclusions are presented on the current state of knowledge and understanding concerning each of these three hydrocarbon resources. Regarding world oil resources, an assumed consensus on 2000 billion barrels ultimately recoverable is, in fact, only weakly supported. Close examination of its component parts reveals widespread disagreement. World natural gas resources are even less well understood. And it is premature to venture a meaningful assessment of world oil-shale resources. Thus, our knowledge and scientific understanding of these significant hydrocarbon resources is inadequate for long-term energy planning. DOE

N83-21500# Geological Survey, Helena, Mont. Water Resources Div.
STREAMFLOW LOSSES TO MADISON GROUP ROCKS IN THE LITTLE BELT AND BIG SNOWY MOUNTAINS, MONTANA Final Water Resources Investigations Report
R. D. Feltis and Ronald R. Shields Aug. 1982 22 p refs
(PB83-117929; USGS/WRD/WRI-82-070; USGS/WRI-82-49)
Avail: NTIS HC A02/MF A01 CSCL 08H

Four streams originating in the Little Belt and Big Snowy Mountains in central Montana were measured at various times from May 4 to October 1, 1975, to determine flow losses as the streams cross outcrops of the Madison Group (Mississippian age). Based on the seepage measurements made during base-flow conditions, streamflow losses in the Middle Fork Judith River were 10.2 cubic feet per second. Based on streamflow data obtained for 39 months at two stream-flow-gaging stations on the Middle Fork Judith River, the average daily loss was 9.1 cubic feet per second or about 6,600 acre-feet per year. Author (GRA)

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N83-21501# Central Electricity Generating Board, London (England).
NUCLEAR POWER COMPARED WITH OTHER ENERGY SOURCES: A BRIEF COMPARATIVE STUDY OF SOME OF THE RISKS
Philipe Wible 26 Oct. 1983 24 p refs Transl. into ENGLISH of report from Federation Romande pour l'Energie Lausanne, Switzerland, 1980 20 p
(BLL-CE-Trans-7745-(9022.09)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Some of the risks involved in the major energy sources were studied. Author

N83-21502# British Library Lending Div., Boston Spa (England).
UTILIZATION OF SECONDARY ENERGY RESOURCES AT MAGNITOGORSK METALLURGICAL COMBINE
V. N. Ermolaev and V. I. Klyuvgant 20 Dec. 1982 14 p Transl. into ENGLISH from Stal (USSR), v. 12, 1981 p 8-11
(BLL-M-26856-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Savings obtained by the use of secondary thermal and energy resources at Magnitogorsk Metallurgical Combine during the period of the 10th five year plan are reviewed. These savings were obtained by fuller utilization of these resources, e.g., fuel from the use of blast furnace and coke oven gases and steam from boiler utilizers and evaporative cooling systems. The savings achieved were substantial. Author

N83-21503* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC INSTABILITY STOPPERS FOR WIND TUNNEL MODELS Patent
Robert V. Doggett, Jr. and Rodney H. Ricketts, inventors (to NASA) Issued 17 Jun. 1981 4 p Filed 17 Jun 1981 Supersedes N81-31230 (19 - 22, p 3020)
(NASA-Case-LAR-12458-1; US-Patent-4,372,158;
US-Patent-Appl-SN-274705; US-Patent-Class-73-147) Avail: US Patent and Trademark Office CSCL 10A

A mechanism for constraining models or sections thereof, was wind tunnel tested, deployed at the onset of aeroelastic instability, to forestall destructive vibrations in the model is described. The mechanism includes a pair of arms pivoted to the tunnel wall and straddling the model. Rollers on the ends of the arms contact the model, and are pulled together against the model by a spring stretched between the arms. An actuator mechanism swings the arms into place and back as desired.
Official Gazette of the U.S. Patent and Trademark Office

N83-21504* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROELASTIC INSTABILITY STOPPERS FOR WIND TUNNEL MODELS Patent
Robert V. Doggett, Jr. and Rodney H. Ricketts, inventors (to NASA) Issued 17 Jun. 1981 6 p Filed 17 Jun 1981 Supersedes N81-31229 (19 - 22, p 3020)
(NASA-Case-LAR-12720-1; US-Patent-4,372,159;
US-Patent-Appl-SN-274706; US-Patent-Class-73-147) Avail: US Patent and Trademark Office CSCL 10A

A mechanism for diverting the flow in a wind tunnel from the wing of a tested model is described. The wing is mounted on the wall of a tunnel. A diverter plate is pivotally mounted on the tunnel wall ahead of the model. An actuator fixed to the tunnel is pivotably connected to the diverter plate, by plunger. When the model is about to become unstable during the test the actuator moves the diverter plate from the tunnel wall to divert maintaining stable model conditions. The diverter plate is then retracted to enable normal flow.
Official Gazette of the U.S. Patent and Trademark Office

N83-21505# Linde A.G., Hollriegelskreuth (West Germany). Tieftemperatur- und Verfahrenstechnik.
OXYGEN SUPPLY FOR COAL GASIFICATION POWER

STATIONS (COMBINED CYCLE PROCESS) Final Report, Feb. 1981
Dietrich Rottmann and Eugen Schoenpflug Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 75 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-018; ISSN-0340-7608) Avail: NTIS HC A04/MF A01

Adaptation of air separation processes to coal gasification plants was investigated. Main points are the start up and the load change behavior of the total process. Air separation processes which put at disposal oxygen most energetically to the combined cycle process are estimated. The technical feasibility of such a plant is checked. The load change behavior of the plant, the adaptation of the coal gasification and the start up of the total system are investigated. The influence of process parameters on the energy consumption is calculated. The most economical air separation processes are investigated. It is found that a low pressure plant with mixed heat exchangers and a medium pressure plant with molsieves are the most economical processes and that air separation processes and the order of magnitude can be constructed economically. E.A.K.

N83-21506# Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany). Hauptbereich Vetrieb und Kraftwerktechnik.
POWER PLANT CONCEPTS USING NEW COAL CONVERSION TECHNOLOGIES Final Report, Dec. 1980
Werner Emsperger, Reiner Engelhardt, Konrad Goebel, Ulrich Schiffers, Hans Traenkenschuh, and Eberhard Wittchow Bonn Bundesministerum fuer Forschung und Technologie Mar. 1982 238 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-031; ISSN-0340-7608; BMFT-03E1124; A/ETS6004A) Avail: NTIS HC A11/MF A01

Alternatives to pulverized coal firing are presented for the use even of low grade coals in large power plant units. The unit ratings and potential efficiencies of such plants are defined and the main determining parameters are analyzed. The problems of start up and part load operation are also discussed. The selection of gasification methods for power plant processes as a basis for power plant concepts using coal gasification is considered. The state of development of the gasification and gas scrubbing processes is described. Conceptual plant configurations and unit ratings are presented. It is demonstrated that there is an incentive to construct power plant processes that incorporate fluidized bed combustion or coal gasification but that a number of development problems remain to be solved for commercial application to become viable. E.A.K.

N83-21507# Siemens A.G., Erlangen (West Germany). Forschungslab.
CONTINUOUSLY ADJUSTABLE LOW-POWER GASIFIER BURNER/BOILER SYSTEM Final Report, Mar. 1981
Hana Kostka and Alfred Michel Bonn Bundesministerium fuer Forschung und Technologie Apr. 1982 134 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-038; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 28,15

The catalytic gasification of straight run gasoline by partial oxidation with air was studied. Test models of a gasifier/boiler system which utilizes heating oil as primary fuel were developed. The systems have the following characteristics: (1) power range from 2 kW to 12 kW; (2) continuously adjustable power; (3) stoichiometric combustion; (4) soot free operation; (5) load independent exhaust temperature; and (6) low, constant exhaust temperature. E.A.K.

N83-21508*# Massachusetts Inst. of Tech., Cambridge.
STABILITY ANALYSIS OF FLEXIBLE WIND TURBINE BLADES USING FINITE ELEMENT METHOD Final Report
Anargiros Kamoulakos Aug. 1982 156 p refs
(Grants NsG-3303; Contract DE-AI01-76ET-20320)
(NASA-CR-168107; DOE/NASA/3303-2; NAS 1.26:168107; MIT-ARSL-TR-197-3) Avail: NTIS HC A08/MF A01 CSCL 10A

Static vibration and flutter analysis of a straight elastic axis blade was performed based on a finite element method solution. The total potential energy functional was formulated according to linear beam theory. The inertia and aerodynamic loads were formulated according to the blade absolute acceleration and absolute velocity vectors. In vibration analysis, the direction of motion of the blade during the first out-of-lane and first in-plane modes was examined; numerical results involve NASA/DOE Mod-0, McCauley propeller, north wind turbine and flat plate behavior. In flutter analysis, comparison cases were examined involving several references. Vibration analysis of a nonstraight elastic axis blade based on a finite element method solution was performed in a similar manner with the straight elastic axis blade, since it was recognized that a curved blade can be approximated by an assembly of a sufficient number of straight blade elements at different inclinations with respect to common system of axes. Numerical results involve comparison between the behavior of a straight and a curved cantilever beam during the lowest two in-plane and out-of-plane modes. Author

N83-21509*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
SIMPLIFIED AEROELASTIC MODELING OF HORIZONTAL AXIS WIND TURBINES Final Report
John H. Wendell Sep. 1982 231 p refs
(Grant NsG-3303; Contract DE-AI01-76ET-20320)
(NASA-CR-168109; DOE/NASA/3303-3; NAS 1.26:168109; MIT-ASRL-TR-197-4) Avail: NTIS HC A11/MF A01 CSCL 10A

Certain aspects of the aeroelastic modeling and behavior of the horizontal axis wind turbine (HAWT) are examined. Two simple three degree of freedom models are described in this report, and tools are developed which allow other simple models to be derived. The first simple model developed is an equivalent hinge model to study the flap-lag-torsion aeroelastic stability of an isolated rotor blade. The model includes nonlinear effects, preconing, and noncoincident elastic axis, center of gravity, and aerodynamic center. A stability study is presented which examines the influence of key parameters on aeroelastic stability. Next, two general tools are developed to study the aeroelastic stability and response of a teetering rotor coupled to a flexible tower. The first of these tools is an aeroelastic model of a two-bladed rotor on a general flexible support. The second general tool is a harmonic balance solution method for the resulting second order system with periodic coefficients. The second simple model developed is a rotor-tower model which serves to demonstrate the general tools. This model includes nacelle yawing, nacelle pitching, and rotor teetering. Transient response time histories are calculated and compared to a similar model in the literature. Agreement between the two is very good, especially considering how few harmonics are used. Finally, a stability study is presented which examines the effects of support stiffness and damping, inflow angle, and preconing. Author

N83-21510*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RESULTS OF THE 1982 NASA/JPL BALLOON FLIGHT SOLAR CELL CALIBRATION PROGRAM
R. G. Downing and R. S. Weiss 1 Mar. 1983 16 p refs
(NASA-CR-170123; NAS 1.26:170123; JPL-Pub-83-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The 1982 solar cell calibration balloon flight was successfully completed on July 21, meeting all objectives of the program. Twenty-eight modules were carried to an altitude of 36.0 kilometers. The calibrated cells can now be used as reference standards in simulator testing of cells and arrays. Author

N83-21511*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
APPLICATIONS GUIDE FOR WASTE HEAT RECOVERY Final Report, May - Dec. 1982

Philip I. Moynihan Jan. 1983 81 p refs
(Contract MIPR-N-82-52)
(NASA-CR-170121; JPL-Publ-83-7; NAS 1.26:170121; DEB-TR-82-02) Avail: NTIS HC A05/MF A01 CSCL 10B

The state-of-the-art of commercially available organic Rankine cycle (ORC) hardware from a literature search and industry survey is assessed. Engineering criteria for applying ORC technology are established, and a set of nomograms to enable the rapid sizing of the equipment is presented. A comparison of an ORC system with conventional heat recovery techniques can be made with a nomogram developed for a recuperative heat exchanger. A graphical technique for evaluating the economic aspects of an ORC system and conventional heat recovery method is discussed: also included is a description of anticipated future trends in organic Rankine cycle R&D. Author

N83-21512*# Spectrolab, Inc., Sylmar, Calif. Advanced Programs.
LARGE AREA, LOW COST SOLAR CELL DEVELOPMENT AND PRODUCTION READINESS Final Report
D. Michaels Jan. 1982 60 p refs
(Contract NAS9-16126)
(NASA-CR-170037; NAS 1.26:170037) Avail: NTIS HC A04/MF A01 CSCL 10A

A process sequence for a large area (> or = 25 sq. cm) silicon solar cell was investigated. Generic cell choice was guided by the expected electron fluence, by the packing factors of various cell envelope designs onto each panel to provide needed voltage as well as current, by the weight constraints on the system, and by the cost goals of the contract. Author

N83-21513# AEG-Telefunken, Wedel (West Germany). Anlagentechnik AG.
TECHNOLOGY OF ELEVATED VOLTAGE SOLAR ARRAYS: KEY ITEMS TEST AND EVALUATION. PART 2: SIMULATED LEO-PLASMA TESTS Final Report
H. Bebermeier, G. Eggers, R. Nuernberger, W. Goelz, and G. Stasek (Physik-Tech. Studien GmbH, Freiburg, West Ger.) Paris ESA Mar. 1982 114 p refs
(Contract ESTEC-3662/78/NL-HP; ESA-4623/81/NL-PP(SC))
(ESA-CR(P)-1646) Avail: NTIS HC A06/MF A01

The electrical layout of a 250 kW solar array was analyzed in TEVSA-KITE I and potential problem areas were identified. In the present report (TEVSA-KITE II) research and development activities are described which have been made necessary by the desire to understand the phenomena observed in the initial tests and to make a more complete assessment of the in-orbit effects of 200 - 1000 volt solar arrays. System and component requirements of the power-conditioning system were compared with current practice in order to identify areas requiring development effort. It was found that for voltages up to 200/300 V, components and systems are available but are not yet space qualified. The high-voltage tests of solar-array components were continued. A critical threshold of 500 - 600 V was identified for vacuum orbit conditions. Outgassing after launch may be a potential reason for failure. The plasma tests at Freiburg showed that there was a very narrow range in which ohmic discharge occurs. Outside this range, a dramatic increase in leakage current is expected. The critical voltage threshold was identified at ca. 250 V. The study shows that current solar-array technology is adequate for low Earth orbit environment up to a voltage of about 250 V. Plasma discharge will then be initiated. At voltages above 500/600 V, partial discharge through the substrate will reduce the lifetime of the solar array.
Author (ESA)

N83-21514# European Space Agency, Paris (France).
EVALUATION OF VARIOUS SOLAR-CELL-TO-INTERCONNECTOR WELDS BY MEANS OF SCANNING LASER ACOUSTIC MICROSCOPY AND METALLOGRAPHY
B. D. Dunn (ESTEC, Noordwijk, Neth.) and W. R. Burke, ed. Aug. 1982 44 p refs
(ESA-STM-225; ISSN-0397-4075) Avail: NTIS HC A03/MF A01

The quality of electrical resistance welds uniting spacecraft solar array components, such as solar cells, interconnectors, shunt diodes and bus bars cannot be assessed by visual inspection. A variety of welded samples, some joined in typical spacecraft configurations and following environmental testing, were examined by nondestructive testing and metallography. The size of the welds was determined and their position located by scanning laser acoustic microscopy. The high accuracy of acoustic micrographs is confirmed by mechanical tests and metallography. A procedure for microsectioning is recommended; it is essential to remove the smeared silver layer on as polished microsections, to reveal the true weld. Of the various interconnector materials it appears that the silver coated molybdenum type provides the most reliable weld. E.A.K.

N83-21515# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hardthausen (West Germany). Abteilung Energie und Antriebe.
THERMODYNAMIC MODEL FOR A CENTRAL RECEIVER OF A SOLAR PLANT WITH PARTIAL SHADING OF THE HELIOSTAT FIELD
Josef Reinkenhof Jul. 1982 121 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-807)
(DFVLR-FB-82-27; ESA-TT-807) Avail: NTIS HC A06/MF A01

The time-dependent loss mechanisms of a heliostat field and a stochastic model for the simulation of partial shading of the heliostat field are discussed. The coupling of the heliostat field with the receiver is reduced to the problem of an aperture covered with directed energy sources and sinks. For the intensity distribution over the aperture a two-dimensional normal distribution was selected. The density of the energy flow can be calculated for any point within the receiver. The local heat flux toward the walls of a receiver with arbitrary geometry is estimated. Especially the case of isothermal walls with re-emitted radiation escaping through the aperture is treated. A computer code CEREMO and numerical results are presented. M.G.

N83-21516# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
EFFECT OF ELECTROLYTE WATER CONTENT ON THE ANODIC PASSIVATION OF LITHIUM IN IM LIC104-PROPYLENE CARBONATE
S. D. James and A. R. Nagao Jun. 1982 23 p refs
(AD-A122283; AD-F500101; NSWC/TR-82-318) Avail: NTIS HC A02/MF A01 CSCL 10/3

This work deals with the effect of aqueous contamination on the anode passivation of Li in 1M LiClO 4-propylene carbonate. Passivation occurs more readily with increasing electrolyte water content. Preliminary evidence suggests that anodic passivation may be due to anodic enrichment and eventual precipitation of LiClO 4 in the superficial anolyte layer. GRA

N83-21517# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 5: FOR CDC LIGHT MANUFACTURING BUILDING, SAN BERNARDINO, CALIFORNIA, FOR JULY 1982
Nov. 1982 24 p Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE83-003801; SAND-81-7089/5) Avail: NTIS HC A02/MF A01

Presented are the data accumulated during July at the intermediate photovoltaic project at the CDC Light Manufacturing Bldg., San Bernardino, California. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided. DOE

N83-21518# Oak Ridge National Lab., Tenn. Energy Div.
EVALUATION OF MISSISSIPPI COUNTY COMMUNITY COLLEGE AND NORTHWEST MISSISSIPPI JUNIOR COLLEGE SOLAR POWER SYSTEMS
S. I. Kaplan Dec. 1982 40 p refs
(Contract W-7405-eng-26)

(DE83-004239; ORNL/TM-8396) Avail: NTIS HC A03/MF A01

Mississippi County Community College (MCCC) and Northwest Mississippi Junior College (NMJC) are the respective sites for two solar power projects. The MCCC Project is undergoing post-startup testing and adjustment; the NMJC equipment is partially installed, and work is currently suspended. The design, construction, test history through October 1981, and recommendations for system improvement at MCCC are discussed; the probable maximum output from the system is estimated. The NMJC project history and status are reviewed and its viability as an operating project is evaluated. DOE

N83-21519# Oak Ridge National Lab., Tenn. Fossil Energy Materials Program Office.

FOSSIL ENERGY MATERIALS PROGRAM PLAN FOR FISCAL YEARS 1982 THROUGH 1986

R. A. Bradley, comp. and R. R. Judkins, comp. Dec. 1982 146 p refs

(Contract W-7405-eng-26)
(DE83-004237; ORNL/TM-7964) Avail: NTIS HC A07/MF A01

A program plan for the Department of Energy Advanced Research and Technology Development Fossil Energy Materials Program reviews the background, technical issues, and research and development needs for materials of construction for fossil energy systems. The status and plans for research and development activities in the Advanced Research and Technology Development (AR and TD) Fossil Energy Materials Program are then discussed for various materials disciplines. Detailed information about these plans is provided for FY 1982 through FY 1984, and descriptions of long-range plans are given for FY 1985 and FY 1986. In addition to descriptions of planned research activities, this plan provides levels of effort required for the various activities. Thus, the emphasis of the program on long-range basic research to address perceived materials problems in the development of fossil energy technologies is indicated. DOE

N83-21520# Ebasco Services, Inc., New York.

PRELIMINARY DESIGN OF AN OSMOTIC-TYPE SALINITY-GRADIENT ENERGY CONVERTER: PHASE 2

Jun. 1982 141 p refs

(Contract DE-AC05-79ET-21001)
(DE92-018379; DOE/ET-21001/1) Avail: NTIS HC A07/MF A01

The preliminary design is presented of a 50 kW/sub e/ closed cycle osmotic pressure power system using a saturated solar pond as the unmixer for the mixed brine with 7.7% potassium alum solution on one side and 52% potassium alum solution on the other side of the semipermeable membrane. Included are: system description with flow diagram, general arrangement, general pipe routing between equipment drawings and component performance specifications; siting restrictions; environmental considerations; pretreatment; membrane characteristics; preliminary system capital, operating and maintenance costs; and recommendations. It was found that the area requirement for a saturated solar pond is less than one tenth of that required for a solar evaporation pond. The pretreatment cost was found to be much less in this case because the system is closed. Finally, the use of a saturated solar pond greatly increases the potential number of sites available for a practical osmotic pressure power system. DOE

N83-21521# Honeywell, Inc., Roseville, Minn. Technology Strategy Center.

SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: HONEYWELL OTS 41, SHENANDOAH (NEWMAN), GEORGIA Final Report

A. K. Mathur and S. Pederson Aug. 1982 87 p refs

(Contract DE-AC03-81CS-30574)
(DE82-021004; DOE/CS-30574/T1) Avail: NTIS HC A05/MF A01

The operation and technical performance of the Solar Operational Test Site (OTS 41) located at Shenandoah, Georgia, are described, based on the analysis of the data collected between January and August 1981. The following topics are discussed: system description, performance assessment, operating energy, energy savings, system maintenance, and conclusions. The solar energy system at OTS 41 is a hydronic heating and cooling system consisting of 702 square feet of liquid-cooled flat-plate collectors; a 1000-gallon thermal storage tank; a 3-ton capacity organic Rankine-cycle-engine-assisted air conditioner; a water-to-are heat exchanger for solar space heating; a finned-tube coil immersed in the storage tank to preheat water for a gas-fired hot water heater; and associated piping, pumps, valves, and controls. The solar system has six basic modes of operation and several combination modes. The system operation is controlled automatically by a Honeywell-designed microprocessor-based control system, which also provides diagnostics. DOE

N83-21522# Bechtel Corp., San Francisco, Calif.

STUDY OF INSTALLED AND LIFE-CYCLE COSTS FOR BATTERIES IN PHOTOVOLTAIC POWER SYSTEMS Final Report

Oct. 1982 452 p refs

(Contract DE-AC04-76DP-00789)
(DE83-003849; SAND-82-7059) Avail: NTIS HC A20/MF A01

The overall objective was to estimate the installed and life-cycle costs of 9 battery technologies in a range of photovoltaic application types and sizes. For each battery type is given is a description of the battery technology, the battery factory price analysis, and the installed and life-cycle cost estimates for the battery in each of the applications evaluated. Battery types include: conventional lead-acid; sealed lead-acid; redox; zinc-bromine batteries of two types; zinc chloride; iron redox; lithium-metal sulfide; and sodium-sulfur. Applications include: shopping center; high school; multiple residence; hotel-motel; remote residence; and single residence. DOE

N83-21523# Utah Univ., Salt Lake City.

GEOTHERMAL POTENTIAL OF ASCENSION ISLAND, SOUTH ATLANTIC. PHASE 1: PRELIMINARY EXAMINATION

B. S. Sibbett, D. L. Neilson, J. H. Ramsthaler (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho), and M. K. Shane (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho) 5 Apr. 1983 94 p refs

(Contract DE-AC07-76ID-01570)
(DE83-004066; IDO-10110) Avail: NTIS HC A05/MF A01

A preliminary evaluation of the potential for an economic geothermal resource at Ascension Island was completed. It is concluded that there is a high potential for the presence of a geothermal resource under the Island. A conceptual plant was designed assuming the resource potential located near Gannet Hill is developed. A 7% discounted payback of 5.9 years was calculated for the baseline geothermal plant. Geothermal development can be easily integrated into the Ascension Island power system in that a selection of small, portable, skid mounted, turn key power geothermal generating systems are commercially available. Geologic findings and plant analysis are summarized. DOE

N83-21524# Argonne National Lab., Ill. Special Projects and Industrial Applications Group.

ENERGY FROM BIOMASS: LAND ANALYSIS AND EVALUATION OF SUPPLY MODELS

S. Y. Shen, J. Stavrou, C. H. Nelson, and A. Vyas Jan. 1982 37 p refs

(Contract W-31-109-eng-38)
(DE83-003333; ANL/CNSV-32) Avail: NTIS HC A03/MF A01

Methods of determining the potential overall impact of land-based biomass production on the agricultural and forestry sectors of the US economy were evaluated. The availability of the factor that possibly limits biomass production the most, land is examined. A summary by US Department of Agriculture regions of the amount of available land with potential for biomass production and not presently in food crop production is presented. Then several currently used agricultural and forestry models that could be used to determine the impact of increased land-based biomass production on the agricultural and forestry sectors are evaluated. It was found that the forestry sector would not be significantly effected even by a level of biomass production with an energy yield as

high as 11 quads. It was recommended that a suitable linear programming model from Iowa State University's Center for Agricultural and Rural Development (CARD) modeling system be used for future analysis. The CARD model would have to be appropriately modified so that biomass grasses and short-rotation trees could be added to the agricultural crops. DOE

N83-21525# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
THE EFFECTS OF ATMOSPHERIC VARIABILITY ON ENERGY UTILIZATION AND CONSERVATION Progress Report
Elmar R. Reiter, J. D. Sheaffer, J. W. Middleton, and A. F. Hanna Aug. 1982 155 p refs
(Contract DE-AC02-76EV-01340)
(DE83-003612; DOE/EV-01340/4) Avail: NTIS HC A08/MF A01

Teleconnections between precipitation surges in the equatorial Pacific, which are tied to the negative phase of the southern oscillation, and midlatitude planetary wave patterns are described. These connections are also evident in long term trend patterns of the winter time midlatitude circulation. Statistically significant planetary wave pattern differences between wet and dry monsoon summers exist in midlatitudes already several months prior to the onset of the monsoon. Numerical model indicate that the frequency of the quasibiennial oscillation can be modulated by variable momentum fluxes in the tropics. Planetary wave pattern variability is significantly influenced by variations in heat source and sink distributions at the Earth's surface. This fact is demonstrated by experiments with a simple, two layer, nonlinear, quasigeostrophic global general circulation model. Preliminary tests of this model were restricted to changes in sea surface temperature anomalies. A heat budget equation was tested to estimate the effects of changes in the surface energy budget on continental surface temperature anomalies. The modelling of urban and regional energy demand as a function of weather variability is summarized. DOE

N83-21526# Sandia Labs., Albuquerque, N. Mex. Vibration and Modal Testing Div.
MODAL TESTING OF A ROTATING WIND TURBINE
Thomas G. Carne and Arlo R. Nord Nov. 1982 19 p refs
(Contract DE-AC04-76DP-00789)
(DE83-003630; SAND-82-0631) Avail: NTIS HC A02/MF A01

A testing technique was developed to measure the modes of vibration of a rotating vertical-axis wind turbine. This technique was applied to the Sandia Two-Meter Turbine, where the changes in individual modal frequencies as a function of the rotational speed were tracked from 0 rpm (parked) to 600 rpm. During rotational testing, the structural response was measured using a combination of strain gages and accelerometers, passing the signals through slip rings. Excitation of the turbine structure was provided by a scheme which suddenly released a pretensioned cable, thus plucking the turbine as it was rotating at a set speed. In addition to calculating the real modes of the parked turbine, the modes of the rotating turbine were also determined at several rotational speeds. The modes of the rotating system proved to be complex due to centrifugal and Coriolis effects. The modal data for the parked turbine were used to update a finite-element model. Also, the measured modal parameters for the rotating turbine were compared to the analytical results, thus verifying the analytical procedures used to incorporate the effects of the rotating coordinate system. DOE

N83-21527# Rockefeller Univ., New York.
SOME BASIC RESEARCH PROBLEMS RELATED TO ENERGY
1982 10 p refs
(Contract DE-AC02-81ER-10807)
(DE83-003753; DOE/ER-10807/7) Avail: NTIS HC A02/MF A01

The prediction and evaluation of thermophysical data of fluids and fluid mixtures are discussed. Models which calculate the transport properties of fluid mixtures according to their dependence on size and mass of the constituent particles are discussed. The application of nonlinear evolution equations to energy related processes is discussed. It is expected that the remarkable progress in this field will have significant practical uses. DOE

N83-21528# Pacific Northwest Lab., Richland, Wash.
CAESCAP: A COMPUTER CODE FOR COMPRESSED-AIR ENERGY-STORAGE-PLANT CYCLE ANALYSIS
J. A. Fort Oct. 1982 84 p refs
(Contract DE-AC06-76RL-01830)
(DE83-003146; PNL-4486) Avail: NTIS HC A05/MF A01

The analysis code, CAESCAP, was developed as an aid in comparing and evaluating proposed compressed air energy storage (CAES) cycles. Input consists of component parameters and working fluid conditions at points along a cycle. The code calculates thermodynamic properties at each point and then calculates overall cycle performance. Working fluid capabilities include steam, air, nitrogen, and parahydrogen. The CAESCAP code was used to analyze a variety of CAES cycles. The combination of straightforward input and flexible design make the code easy and inexpensive to use. DOE

N83-21529# United Technologies Research Center, East Hartford, Conn.
CERAMIC HEAT-EXCHANGER APPLICATIONS STUDY
David J. McFarlin, Carmen T. Sgamboti, and Robert D. Lessard Oct. 1982 99 p refs Sponsored in part by ORNL
(Contract W-7405-eng-26)
(DE83-003166; ORNL/Sub-81/92352/1) Avail: NTIS HC A05/MF A01

To put the potential benefits of ceramic heat exchangers (CHX) applications into quantitative perspective, several industrial cogeneration and electric utility power generation systems were evaluated. Coal based fuel fired applications, for which system performance and economic assessments were made were studied. Seven CHX applications were selected for evaluation. These include: (1) gasified coal fired gas turbine; (2) pressurized fluidized bed combustor (PFBC) gas turbine; (3) atmospheric fluidized bed combustor (AFBC) gas turbine; (4) and (5) AFBC combined cycle with and without reheat; and (6) and (7) indirect coal fired gas turbine and combined cycle. The performance and economics of these cogeneration systems were evaluated and compared with other competing systems. For the electric utility power generation sector five applications utilizing a CHX were selected and evaluated; their performance and cost factors were compared to those of a reference pulverized coal fired steam plant with flue gas desulfurization. The five applications included: PFBC combined cycle, AFBC combined cycle, industrial coal gasifier combined cycle, indirect coal fired combined cycle, and indirect coal fired simple cycle. Of the five CHX applications evaluated in the power generation sector, only the AFBC system shows a clear gain over the reference pulverized coal system. DOE

N83-21530*# Honeywell, Inc., Roseville, Minn. Technology Strategy Center.
SOLAR-ENERGY-SYSTEM PERFORMANCE EVALUATION: HONEYWELL OTS 44, OCMULGEE, GEORGIA Final Report
Anoco K. Mathur and Steve Pederson Aug. 1982 73 p refs
(Contracts NAS8-32093; DE-AC03-81CS-30574)
(NASA-CR-170031; NAS 1.26:170031; DE83-000086; DOE/CS-30574/T2) Avail: NTIS HC A04/MF A01

The operation and technical performance of the solar operational test site (OTS 44) are described, based on data collected between April, 1981 and August, 1981. The following topics are discussed: system description, performance assessment, operating energy, energy savings, system maintenance, and conclusions. The solar energy system at OTS 44 is a hydronic heating and cooling system consisting of 5040 square feet of liquid cooled flat plate collectors; a 4000 gallon thermal storage tank; one 25 ton capacity organic Rankine cycle engine assisted water chillers; a forced draft cooling tower; and associated piping, pumps, valves, controls and heat rejection equipment. The solar system has eight basic modes of operation and several combination modes for providing space conditioning and hot water to the building. Data monitored during the 4 months of the operational test period found that the solar system collected 285 MMBtu of thermal energy of the total incident solar energy of 1040 MMBtu and provided 210 MMBtu for cooling and 10 MMBtu for heating and hot water.

The net electrical energy saving due to the solar system was approximately 2600 kWh(e), and fossil energy saving was about 20 million Btu (MMBtu). DOE

N83-21531# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FROM CORN: 100-MILLION-GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA. VOLUME 1: EXECUTIVE SUMMARY
31 May 1982 153 p Prepared in cooperation with Chemapec, Inc., Woodbury, N.Y. 7 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000777; DOE/ID-12274/T1-Vol-1) Avail: NTIS HC A08/MF A01

An executive summary is given of a detailed feasibility study for a 100 million gallon per year power alcohol plant using corn as feedstock. The proposed plant will ultimately have the capability to produce 100 million gallons per year of anhydrous alcohol from an estimated 40 million bushels of corn and will be designed so as to allow construction in modules of 25 million gallons each. Alcohol produced at this plant is intended essentially for use as a gasoline octane booster, a motor fuel in gasoline/alcohol blends and as a chemical feedstock. In addition, the plant will produce a number of by-products, each of which has existing commercial markets; namely, 236,400 tons of CO2, 237,600 tons of protein meal mixture (40.2% protein), or 124,000 tons of gluten meal (41% protein), 20,000 tons of yeast, 68,400 tons of corn bran, 89,600 tons of corn germ cake and 4,584,000 gallons of corn oil (food grade). DOE

N83-21532# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FROM CORN: 100-MILLION-GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA
31 May 1982 343 p Prepared in cooperation with Chemapec, Inc., Woodbury, N.Y. 7 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000776; DOE/ID-12274/T1-Vol-2) Avail: NTIS HC A15/MF A01

The technical and economic feasibility of producing motor fuel alcohol from corn in a 100 million gallon per year plant to be constructed in Myrtle Grove, Louisiana is evaluated. The evaluation includes a detailed process design using proven technology, a capital cost estimate for the plant, a detailed analysis of the annual operating cost, a market study, a socioeconomic, environmental, health and safety analysis, and a complete financial analysis. Several other considerations for production of ethanol were evaluated including: cogeneration and fuel to be used in firing the boilers; single by-products vs. multiple by-products; and use of boiler flue gas for by-product drying. DOE

N83-21533# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FROM CORN: 100-MILLION-GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA
31 May 1982 513 p Prepared in cooperation with Chemapec, Inc., Woodbury, N.Y. 7 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000775; DOE/ID-12274/T1-Vol-3) Avail: NTIS HC A22/MF A01

The technical and engineering plan for an ethanol from corn fuel grade production facility is given. Included is a review of current technology, process technology recommendation, single vs. multi by-product process, process description, resource requirements, utilities, use of boiler flue gas for by-product drying, plant layout alternatives, production schedule, and procurement plan. As components of production the following are covered: corn supply, other raw materials supply, site selection, and the socio-economic environment of the area. The community infrastructure of Plaquemines Parish is described. DOE

N83-21534# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FROM CORN: 100-MILLION-GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA. VOLUME 5: APPENDICES
31 May 1982 556 p Prepared in cooperation with Chemapec, Inc., Woodbury, N.Y. 7 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000773; DOE/ID-12274/T1-Vol-5) Avail: NTIS HC A24/MF A01

Issues pertinent to a feasibility analysis of a corn to fuel-grade ethanol production facility are discussed. Included are: comparison of assumptions and results among studies, base case scenarios, production option analyses, selected sensitivity analysis reference output data, background on government incentives, industrial revenue bonds in Louisiana (conditions and procedures, draft permit application), and capital cost estimates. DOE

N83-21535# Singmaster and Breyer, New York.
TECHNICAL/COMMERCIAL FEASIBILITY STUDY OF THE PRODUCTION OF FUEL-GRADE ETHANOL FROM CORN: 100-MILLION-GALLON-PER-YEAR PRODUCTION FACILITY IN MYRTLE GROVE, LOUISIANA
31 May 1982 163 p refs Prepared in cooperation with Chemapec, Inc., Woodbury, N.Y. 7 Vol.
(Contract DE-FG07-81ID-12274)
(DE83-000774; DOE/ID-12274/T1-Vol-4) Avail: NTIS HC A08/MF A01

The management and execution plan for phase 2 construction of an ethyl alcohol production facility is given. Socioeconomic, environmental, health and safety issues are discussed. An economic analysis and a feasibility analysis are given. DOE

N83-21536# Department of Energy, Washington, D. C. Assistant Secretary for Conservation and Renewable Energy.
US HEAT-PUMP RESEARCH AND DEVELOPMENT PROJECTS
Aug. 1982 176 p
(DE83-000943; DOE/CE-0035) Avail: NTIS HC A09/MF A01

A compilation of 153 research project summary forms which provide descriptive data about individual R and D projects is provided. The document is intended to include all heat pump projects for which results are publicly available. DOE

N83-21537# Sandia Labs., Albuquerque, N. Mex. Photovoltaic Concentrator Technology Div.
SHADING ANALYSIS OF A PHOTOVOLTAIC-CELL STRING ILLUMINATED BY A PARABOLIC-TROUGH CONCENTRATOR
Michael W. Edenburn and James R. Burns (Texas Technological Univ., Lubbock) Sep. 1982 27 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002646; SAND-81-2270) Avail: NTIS HC A03/MF A01

The analysis considers a linear string of cells with diode bypassing illuminated by a horizontal north-south axis, parabolic trough, sunlight concentrator. Shadows are cast on the cell string by the end of the concentrator and by transverse gaps in its reflective surface. There are three parts to the model used in the analysis: (1) a model that determines the illumination for each cell; (2) a model that calculates the I-V curve for each cell; and (3) a string model that determines if dioded strings are bypassed and finds the whole string's maximum power. The three parts of the model were used in an annual simulation to determine the performance of a string for a variety of diode arrangements, for cell removal from the south end, and for cell addition to the north end of the receiver. The analyses show that string performance is improved by removing cells from the south end and adding cells to the north end of the receiver, and by using a smaller number of cells per diode at the ends of the receiver. DOE

N83-21538# Argonne National Lab., Ill. Energy and Environmental Systems Div.
A TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS. DIRECT COMBUSTION OF WOOD AND OTHER BIOMASS IN INDUSTRIAL BOILERS

H. I. Abelson, L. J. Habegger, and B. C. Liu Dec. 1981 33 p refs
(Contract W-31-109-eng-38)
(DE83-000937; ANL/EES-TM-189) Avail: NTIS HC A03/MF A01

The cost, resource requirements, and environmental characteristics of a model combustion system sized to handle an annual feed of 12,500 dry tons of forest residue were evaluated. The cost of the wood combustion system is comparable to that of coal fired boilers in industry. Atmospheric emissions of the wood system are lower in sulfur dioxide than those of coal systems, but emissions of particulate matter are potentially higher. The combined use of multicyclones and wet scrubbers, however, can reduce these emissions to levels produced by coal systems. Cost and environmental characteristics of boilers that burn sugarcane bagasse are compared to those of wood fired boilers because the two systems are similar. DOE

N83-21539# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT OF COPPER SULFIDE/CADMIUM SULFIDE THIN-FILM SOLAR CELLS Technical Progress Report, 1 Jan. - 31 Mar. 1982
J. R. Szedon 26 Aug. 1982 24 p refs
(Contract DE-AC02-77CH-00178)
(DE83-001421; SER/PR-8143-1-T10; TPR-11) Avail: NTIS HC A02/MF A01

The improvement of the stability of Cu2S/CdS thin film solar cells with conversion efficiency values of 9% or greater were characterized. The identification of mechanisms which degrade cell performance, improvement of the stability of cells by encapsulation, and to improve the intrinsic stability of the cells by modifying the cell structure during or after fabrication is studied. No rapid component of short circuit current loss due to aging in moist oxygen was found. For the first 54 hours of aging results can be fitted using a single time constant with a value of about 30 hours. Information was obtained on the rate of change of the effective density of donors in the CdS space charge region, which modulates the tunnelling opposing current that controls open circuit voltage behavior in these cells. An increase in the density of donors of about 70% during 400 hours of aging is observed. The increase could be fit to an exponential function with a time constant of about 35 hours. DOE

N83-21540# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
A STUDY OF FALLING-JET FLASH EVAPORATORS
F. Kreith, D. A. Olson, D. Bharathan, and H. J. Green Nov. 1982 15 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-002462; SERI/TP-252-1415) Avail: NTIS HC A02/MF A01

Experimental results of flash evaporation from sheets of water, 3.2 mm and 6.3 mm thick and 27.9 cm wide, falling freely in the presence of their own vapor, are reported. With no flashing the jets fall in coherent sheets, but with flashing the jets were observed to spread and break up into droplets. Flashing was characterized by an effectiveness parameter, which increased with increasing water temperature and jet length. Variations in water flow rate and heat flux did not influence the effectiveness appreciably. DOE

N83-21541# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT. VOLUME 2: G. N. WILCOX MEMORIAL HOSPITAL, KAUAI, HAWAII
Oct. 1982 51 p 2 Vol.
(Contract DE-AC04-76DP-00789)
(DE83-002139; SAND-81-7080-2) Avail: NTIS HC A04/MF A01

Energy generation and environmental (weather) data accumulated during April and May 1982 were presented. Explanations of irregularities not attributed to weather were provided. B.G.

N83-21542# Advanced Energy and Technology Associates, Dover, N.H.
BENEFITS ANALYSIS FOR THE PRODUCTION OF FUELS AND CHEMICALS USING SOLAR THERMAL ENERGY Final Report
May 1982 155 p refs
(Contract DE-AC03-81SF-11526)
(DE83-001023; DOE/SF-11526/T1) Avail: NTIS HC A08/MF A01

A decision analysis technique geared to the analysis of Sun fuels options was developed. Conventional scoring methods were combined with multi-attribute utility analysis in a new approach called the Multi-Attribute Preference Scoring (MAPS) system. MAPS calls for the designation of major categories of attributes which describe critical elements of concern for the processes being examined. The six major categories include: Process Demonstration; Full-Scale Process, Feedstock; End-Product Market; National/Social Considerations; and Economics. MAPS calls for each attribute to be weighted on a simple scale for all of the candidate processes. Next, a weight is assigned to each attribute, thus creating a multiplier to be used with each individual value to derive a comparative weighting. Last, each of the categories of attributes themselves are weighted, thus creating another multiplier, for use in developing an overall score. With sufficient information and industry input, each process can be ultimately compared using a single figure of merit. Three synthesis gas processes, two hydrogen and one ammonia were fully assessed, and fourteen processes were partially assessed. DOE

N83-21543# JBF Scientific Corp., Wilmington, Mass.
FEDERAL APPLICATIONS FOR WIND ENERGY SYSTEMS. A SUBCONTRACT REPORT
J. E. Wilson, R. L. Schreibeis, R. Neal, N. Berube, and G. C. Heffner 1982 131 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-000306; SERI/STR-211-1707) Avail: NTIS HC A07/MF A01

The Federal Applications Study of wind energy systems performed the following functions: surveyed potential applications and sites where wind power could be used by Federal facilities for electricity production, analyzed the current cost competitiveness of both small and large wind energy conversion systems (WECS) for use by Federal agencies, identified those sites where WECS are currently economically competitive with the marginal costs of new conventional energy sources, identified promising Federal applications for further consideration by the appropriate agency, case studies of two sites which are typical of promising Federal applications, and provided planning guidelines for those agencies interested in implementing wind energy programs or systems at their facilities. The approach of data collection which are needed for the economic evaluations is described. Categories of data collected are site specific electrical load and wind resource data, and wind system performance data and economic parameters. The results of preliminary screening and of the detailed analysis and case studies are reported. DOE

N83-21544# Engineering and Economics Research, Inc., Vienna, Va.
INTEGRATION OF HYDROTHERMAL-ENERGY ECONOMICS: RELATED QUANTITATIVE STUDIES
Aug. 1982 127 p refs
(Contract DE-AC07-81ID-12314)
(DE83-001407; DOE/ID-12314/T1) Avail: NTIS HC A07/MF A01

A comparison of ten models for computing the cost of hydrothermal energy is presented. This comparison involved a detailed examination of a number of technical and economic parameters of the various quantitative models with the objective of identifying the most important parameters in the context of accurate estimates of cost of hydrothermal energy. Important features of various models, such as focus of study, applications, marked sectors covered, methodology, input data requirements, and output are compared in the document. A detailed sensitivity analysis of all the important engineering and economic parameters is carried out to determine the effect of non-consideration of individual parameters. DOE

N83-21545# Geothermal Development Associates, Reno, Nev.
GEOTHERMAL ENERGY IN NEVADA: DEVELOPMENT AND UTILIZATION
1982 24 p refs
(Contract DE-FC03-80RA-50075)
(DE83-001783; DOE/RA-50075/T14) Avail: NTIS HC A02/MF A01

The nature of geothermal resources in Nevada and resource applications are discussed. The social and economic advantages of using geothermal energy are outlined. Federal and state programs established to foster the development of geothermal energy are discussed. DOE

N83-21546# Tennessee Valley Authority, Chattanooga. Technical Support Section.
ENERGY USE TEST FACILITY: CAC-DOE SOLAR AIR HEATER TEST REPORT
Nov. 1981 59 p refs
(DE83-900162; TVA/OP-ECR-82-30) Avail: NTIS HC A04/MF A01

The solar air heater testing demonstrated an attractive application for residential space heating, especially appealing to the do-it-yourself market. Simple improvements in construction, such as caulking of the glazing, could increase collector performance at little cost. The operating cost of the fan was insignificant, being less than $0.05/week. Tested in its as-shipped configuration at 96.1 cfm (3 cfm/ft (2)), the useful energy delivered averaged 20,000 Btu/day for six days in December. The electrical consumption of the fan was approximately 1 kWh. Doubling the flowrate did not increase collector performance appreciably. A TRNSYS computer simulation model for this solar air heater design was validated by comparing the measured test data on Jaunary 4, 1981 with calculated values. TRNSYS predicted that measured collector outlet temperatures within +- 1.20F and the energy delivered within +- 3%. The excellent agreement was obtained by adjusting the collector loss coefficient to an unrealistically low value; therefore, a parametric study is recommended to determine the model sensitivity to varying different parameters. A first-order collector efficiency curve was derived from the TRNSYS simulations which compared well with the curve defined by the clear-day measured data. DOE

N83-21547# Boeing Engineering and Construction Co., Seattle, Wash.
PHOTOVOLTAIC CONCENTRATOR WITH PLASTIC-FILM REFLECTOR Final Report
Jun. 1982 84 p refs Prepared for Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE83-001715; SAND-82-7102) Avail: NTIS HC A05/MF A01

A 4 m diameter reflective film, parabolic dish concentrator proposed for use with a photovoltaic array has been designed, fabricated, and tested. The concentrator is made from aluminized film gores (wedge shaped pieces) that are taped together along their edges to form a dish. The shape of the dish is maintained by a pressure difference between the front and back. The deep dish was designed to illuminate a cylindrical receiver populated by solar cells with a geometric concentration ratio of 145. Three full scale dishes were made in sequence, each using improvements suggested by the previous design. They were tested with a laser to determine surface errors and flux uniformity on the target. DOE

N83-21548# Washington Univ. Technology Associates, Inc., St. Louis, Mo.
THE INVESTIGATION OF PASSIVE BLADE CYCLIC PITCH VARIATION USING AN AUTOMATIC YAW CONTROL SYSTEM Final Report
K. H. Hohenemser and A. H. P. Swift Aug. 1982 92 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-000651; SERI/TR-11052-2) Avail: NTIS HC A05/MF A01

Passive cyclic pitch variation using an automatic yaw control system was investigated. The atmospheric test equipment consisted of a horizontal axis wind turbine with vane controlled upwind two bladed rotor of 7.6 m diameter with passive cyclic pitch variation. An automatically triggered electric furl actuator prevented overspeeds and overtorques by furling the rotor which means yawing the rotor out of the winds. The atmospheric test equipment was modified to accept two alternative fully automatic yaw or furl control systems. The first system included a hydraulic single acting constant speed governor as it is used for aircraft propeller controls. The second automatic control system was of a purely mechanical passive type. The analytically predicted and experimentally substantiated negative rotor yaw damping would cause excessive furling rates unless alleviated by a furl damper. The tests were supported by a dynamic yawing analysis. Both analysis and tests indicate that the two bladed passive cyclic pitch wind rotor can be effectively torque or speed limited by rotor yaw control systems which are less costly and more reliable than the conventional blade feathering control systems. DOE

N83-21549# Physical Sciences, Inc., Andover, Mass.
SYSTEMS ANALYSIS OF ON-SITE INTEGRATED ENERGY SYSTEMS, PHASE 1 Final Report
S. Bloomfield, M. Heller, and G. Wilemski 20 Sep. 1982 149 p refs
(Contract DE-AC01-81FE-15078)
(DE83-000044; DOE/FE-15078/1) Avail: NTIS HC A07/MF A01

The objective was to study the effect of technology variation on the cost and performance of on-site (OSIES) fuel cell power plants and to provide systems analysis codes and models for DOE use in their technology assessment. The approach followed was to develop a systems model of a 40 kW OSIES power plant using the thermodynamic analysis capabilities of the PSI/S3E program. A cost model of the power plant was developed. This code uses a VisiCalc spread sheet analysis, allowing sensitivity studies to be performed quickly. Several PSI/S3E models to simulate the advanced technologies were updated and these models were incorporated into the existing power plant simulation code. The effect of technology variations on power plant cost and efficiency were determined. DOE

N83-21550# Los Alamos Scientific Lab., N. Mex.
FEASIBILITY EVALUATION OF FUEL CELLS FOR SELECTED HEAVY-DUTY TRANSPORTATION SYSTEMS
J. R. Huff and H. S. Murray Oct. 1982 46 p refs
(Contract W-7405-eng-36)
(DE83-002953; LA-9488-MS) Avail: NTIS HC A03/MF A01

A study of the feasibility of using fuel cell power plants for heavy duty transportation applications is performed. It is concluded that it will be feasible to use fuel cell technology projected as being available by 1995 to 2000 for powering 3000-hp freight locomotives and 6000-hp river boats. The fuel cell power plant is proposed as an alternative to the currently used diesel or diesel-electric system. Phosphoric acid and solid polymer electrolyte fuel cells are determined to be the only applicable technologies in the desired time frame. Methanol, chemically reformed to produce hydrogen, is determined to be the most practical fuel for the applications considered. Feasibility is determined on the basis of weight and volume constraints, compatibility with existing propulsion components, and adequate performance relative to operational requirements. Simulation results show that performance goals are met and that overall energy consumption of heavy duty fuel cell power plants is lower that of diesels for the same operating conditions. Overall energy consumption is substantially improved over diesel operation for locomotives. DOE

N83-21551# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
A 10-MWe SOLAR-THERMAL CENTRAL-RECEIVER PILOT PLANT: SOLAR FACILITIES DESIGN INTEGRATION. PLANT OPERATING/TRAINING MANUAL (RADL-ITEM 2-36)
Jul. 1982 301 p
(Contract DE-AC03-79SF-10499)
(DE83-001670; DOE/SF-10499/83-Rev; SAN-049983-Rev; MDC-G-9707-Rev) Avail: NTIS HC A14/MF A01

Plant and system level operating instructions are provided for

the Barstow Solar Pilot Plant. Individual status instructions are given that identify plant conditions, process controller responsibilities, process conditions and control accuracies, operating envelopes, and operator cautions appropriate to the operating condition. Transition operating instructions identify the sequence of activities to be carried out to accomplish the indicated transition. Most transitions involve the startup or shutdown of an individual flowpath. Background information is provided on collector field operations, and the heliostat groupings and specific commands used in support receiver startup are defined. Author

N83-21552# Science Applications, Inc., La Jolla, Calif.
USER'S MANUAL FOR HEAT-PUMP SEASONAL-PERFORMANCE MODEL (SPM) WITH SELECTED PARAMETRIC EXAMPLES
30 Jun. 1982 92 p refs
(Contract DE-AC01-79CS-10757)
(DE83-002455; SAI-444-82-141-LJ; TRT-3) Avail: NTIS HC A05/MF A01

The Seasonal Performance Model (SPM) was developed to provide an accurate source of seasonal energy consumption and cost predictions for the evaluation of heat pump design options. The program uses steady state heat pump performance data obtained from manufacturers' or Computer Simulation Model runs. The SPM was originally developed in two forms - a cooling model for central air conditioners and heat pumps and a heating model for heat pumps. The original models have undergone many modifications, which are described, to improve the accuracy of predictions and to increase flexibility for use in parametric evaluations. Insights are provided into the theory and construction of the major options, and into the use of the available options and output variables. Specific investigations provide examples of the possible applications of the model. DOE

N83-21553# Science Applications, Inc., La Jolla, Calif.
USER'S MANUAL FOR STEADY-STATE COMPUTER SIMULATION FOR AIR-TO-AIR HEAT PUMPS WITH SELECTED EXAMPLES
30 Jun. 1982 89 p refs
(Contract DE-AC01-79CS-10757)
(DE83-002446; SAI-444-82-140-LJ; TRT-3) Avail: NTIS HC A05/MF A01

A steady-state computer simulation model was developed for conventional, vapor compression cycle, electrically driven air-to-air heat pumps. Comparison between the heat pump simulation model predictions and available data from three heat pump experiments indicate that the predictions generally are within accepted tolerance. A sensitivity analysis was made to assess the effect of possible variations in some of the input parameters on the system's thermal performance. The computer simulation model input data and output are given. DOE

N83-21554# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
TESTING OF ADVANCED MIRRORS
Gary Jorgensen Sep. 1982 18 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-022184; SERI/RR-255-1630) Avail: NTIS HC A02/MF A01

The advanced miror screening tests are summarized. The objective of this work was to obtain data indicative of the durability and corrosion resistance of a number of candidate advanced mirror samples subjected to several environmental parameters. Different glass substrates were used and several back protection processes were employed. The extent of degradation was characterized by a variety of optical tests as well as by visual inspection. DOE

N83-21555# San Diego Unified School District, Calif.
INTEGRATED SOLAR HEATING, COOLING, AND HOT-WATER SYSTEM FOR UNIVERSITY CITY HIGH SCHOOL, SAN DIEGO, CALIFORNIA Final Report
1982 419 p
(Contracts DE-FC03-77CS-31499; EG-77-A-03-1499)
(DE82-020993; DOE/CS-31499/T2) Avail: NTIS HC A18/MF A01

This active hydronic system for solar heating, absorption cooling, and water heating uses 17,532 square feet of concentrating collectors. The storage capacity is 88,800 gallons. The system schematics and operation and maintenance instructions are included. DOE

N83-21556# Sandia Labs., Albuquerque, N. Mex. Electromechanical Component Test Equipment.
A MICROPROCESSOR-CONTROLLED PHOTOVOLTAIC-ARRAY LOADING UNIT
D. Farrell Russell Aug. 1982 60 p
(Contract DE-AC04-76DP-00789)
(DE83-000797; SAND-82-1744) Avail: NTIS HC A04/MF A01

A microprocessor controlled test system in operation at the Photovoltaics Advanced Systems Test Facility is described. The test system is designed to measure the total energy output of photovoltaic arrays. The theory, installation, operation, and calibration of the test system are described. DOE

N83-21557# Wolf (Ludwig, Jr.), Crystal Lake, Ill.
THE DESIGN, EFFECTIVENESS AND CONSTRUCTION OF PASSIVE-THERMAL-CONTROL ROOFING SHINGLES Technical Final Report
Ludwig Wolf, Jr. Sep. 1982 61 p
(Contract DE-FG02-81R5-10296)
(DE83-001465; DOE/R5-10296/T1) Avail: NTIS HC A04/MF A01

The concept of a passive thermal control roofing shingle, which is a shingle that reflects the summer sun and absorbs the winter sun, is discussed. It is indicated that it is possible to design shingles for particular latitudes and styles of roof which absorb nearly all of the winter solar energy and reflect nearly all of the summer solar energy. Calculations of the energy savings and cost effectiveness of the passive thermal control roofing shingle indicate that it is most cost effective on all south facing pitched roofs regardless of heating fuel type, and on flat or east or west facing roofs that are heated with costly fuels such as electricity or heating oil. The shingle is most effective on poorly insulated structures. The feasibility of using the passive thermal control roofing shingle in conjunction with a heat pump to pump heat absorbed by the shingle into a well insulated structure is demonstrated. Construction of a variety of models of the passive thermal control roofing shingle illustrate numerous alternate methods of manufacture. A profile extruded, plastic, glazed shingle appears to be the most promising approach. Use of a glazed shingle can increase the effectiveness of the passive thermal control roofing shingle by reducing convective heat losses. DOE

N83-21558# JBF Scientific Corp., Wilmington, Mass.
ASSESSMENT OF DISTRIBUTED PHOTOVOLTAIR ELECTRIC-POWER SYSTEMS Summary Report
R. W. Neal, P. F. DeDuck, and R. N. Marshall Oct. 1982 53 p
Sponsored by Electric Power Research Inst.
(EPRI Proj. 1192-1)
(DE83-900531; EPRI-AP-2687-SY) Avail: NTIS HC A04/MF A01

The development of a methodology to assess the potential impacts of distributed photovoltaic (PV) systems on electric utility systems, including subtransmission and distribution networks, and to apply that methodology to several illustrative examples was developed. The investigations focused upon five specific utilities. Impacts upon utility system operations and generation mix were assessed using accepted utility planning methods in combination with models that simulate PV system performance and life cycle economics. Impacts on the utility subtransmission and distribution systems were also investigated. The economic potential of distributed PV systems was investigated for ownership by the utility as well as by the individual utility customer. DOE

N83-21559# Science Applications, Inc., La Jolla, Calif.
PROGRAM LISTING FOR AIR-TO-AIR HEAT PUMP STEADY-STATE COMPUTER-SIMULATION MODE (CSM)

30 Jun. 1982 141 p refs
(Contract DE-AC01-79CS-10757)
(DE83-002549; SAI-444-82-142-LJ) Avail: NTIS HC A07/MF A01

The computer program HPCSM is listed which computes steady state performance of an air-to-air heat pump in the cooling and heating mode using compressor performance maps. DOE

N83-21560# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
FLASH PHOTOELECTROCHEMICAL STUDIES OF TRANSIENT ELECTRODE PROCESSES IMPORTANT IN SOLAR-ENERGY CONVERSION Final Report
Sam P. Perone Oct. 1982 25 p
(Contract DE-AC02-77ER-04263)
(DE83-003134; DOE/ER-04263/5) Avail: NTIS HC A02/MF A01

Electroanalytical and spectroscopic measurement techniques were applied to the study of transient photolytic, photoemissive, and photoelectrolytic processes associated with UV-visible irradiation of an electrode/solution interface. Both semiconductor and metallic electrodes were employed. For the characterization of transient phenomena, the general methodology of flash photolysis was employed (including both xenon flash lamp and tunable pulsed dye laser sources). The perspective afforded by transient electroanalytical/spectroscopic measurements of photoinitiated electrode processes provided more definitive mechanistic insight to solar conversion phenomena in photogalvanic or photoelectrolysis processes. DOE

N83-21561# Governor's Div. of Energy Resources, Columbia, S.C.
SOUTH CAROLINA ENERGY OUTLOOK
1982 222 p refs Sponsored in part by Governor's Div. of Energy Resources
(Contract DE-FG44-78CS-60055)
(DE83-002121; DOE/CS-60055/T2) Avail: NTIS HC A10/MF A01

This long-range energy outlook study describes current energy supply and demand and presents forecasts of energy demand through the year 1995. The trends and forecasts are analyzed, and resulting policy and program recommendations are made. DOE

N83-21562# Advanced Technology, Inc., McLean, Va.
PHOTOVOLTAIC OFF-FARM AGRICULTURAL APPLICATIONS: VOLUME 2: TECHNICAL REPORT Final Report
W. F. Adolfson Feb. 1982 200 p refs
(Contract DE-AC04-76DP-00789)
(DE82-009320; SAND-81-7175-Vol-2) Avail: NTIS HC A09/MF A01

Five conceptual designs available for supplementing the energy required by off-farm agricultural applications are highlighted. Illustrations and parametric cost analyses are provided to assist energy managers in assessing the options and selecting designs for retrofit of existing systems or incorporation of new installations. DOE

N83-21563# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE. VOLUME 5: BEVERLY HIGH SCHOOL, BEVERLY MASSACHUSETTS, EXECUTIVE SUMMARY
Mar. 1982 8 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014711; SAND-81-7102/5-Vol-5) Avail: NTIS HC A02/MF A01

Performance data are given for a grid-connected, 100 kW, flat panel photovoltaic power system at a Massachusetts high school for the month of February 1982. Data include daily and monthly electrical energy produced, daily and monthly plane-of-array incident solar energy, array efficiency, power conditioner efficiency, system efficiency, capacity factor, and monthly average insolation. Also included is the data acquisition mode and recording interval plot. DOE

N83-21564# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL EXECUTIVE SUMMARY. VOLUME 7: NEWMAN POWER STATION, EL PASO, TEXAS
Feb. 1982 11 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014647; SAND-81-7100/7-Vol-7) Avail: NTIS HC A02/MF A01

Performance data are given for a 20 kW photovoltaic power system for a computer's uninterruptable power supply at a Texas utility for the month of January 1982. Data given include daily and monthly electrical energy produced, daily and monthly plane-of-array incident solar energy, array efficiency, capacity factor, and monthly average plane-of-array insolation. Also included is the data acquisition mode and recording interval plot and five site event report summaries involving data acquisition and one event of array damage. DOE

N83-21565# Sandia Labs., Albuquerque, N. Mex.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE EXECUTIVE SUMMARY. VOLUME 4: FOR BEVERLY HIGH SCHOOL, BEVERLY, MASSACHUSETTS
Feb. 1982 13 p refs Prepared in cooperation with Boeing Computer Services Co., Seattle
(Contract DE-AC04-76DP-00789)
(DE82-014650; SAND-81-7102/4-Vol-4) Avail: NTIS HC A02/MF A01

Performance data are given for a 100 kW grid-connected flat panel photovoltaic power supply at a Massachusetts high school for the month of January 1982. Data given include daily and monthly electrical energy produced, daily and monthly plane-of-array solar energy incident, array efficiency, power conditioner efficiency, system efficiency, capacity factor, and average plane-of-array insolation. Also included are the data acquisition mode and recording interval plot and two site event report summaries involving the data acquisition system. DOE

N83-21566# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE EXECUTIVE SUMMARY. VOLUME 7: LOVINGTON SQUARE SHOPPING CENTER, LOVINGTON, NEW MEXICO
Feb. 1982 10 p refs
(Contract DE-AC04-76DP-00789)
(DE82-014649; SAND-81-7099/7-Vol-7) Avail: NTIS HC A02/MF A01

Performance data are given for a 100 kW grid-connected flat panel photovoltaic power supply at a New Mexico shopping center for the month of January 1982. Data include the daily and monthly electrical energy produced, daily and monthly solar energy incident on the array plane, average array efficiency, power conditioner efficiency, system efficiency, capacity factor, and monthly average plane-of-array insolation. Also included is the data acquisition mode and recording interval plot and three site event report summaries involving data collection. DOE

N83-21567# Sandia Labs., Albuquerque, N. Mex.
CENTRAL RECEIVER TEST FACILITY ASSEMBLY BUILDING
C. R. Maxwell and J. T. Holmes Jan. 1982 16 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010853; SAND-81-1735) Avail: NTIS HC A02/MF A01

The passively solar heated Assembly Building located at the Central Receiver Test Facility and its performance during a one-year data acquisition period are described. The effect of the air changes per hour on the solar savings fraction as well as the performance of the south facing thermal storage wall when supplementally illuminated are detailed. DOE

N83-21568# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
STEAM GENERATION IN LINE-FOCUS SOLAR COLLECTORS: A COMPARATIVE ASSESSMENT OF THERMAL PERFOR-

MANCE, OPERATING STABILITY AND COST ISSUES
L. M. Murphy and E. Kenneth May Apr. 1982 166 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-4042)
(DE82-014531; SERI/TR-632-1311) Avail: NTIS HC A08/MF A01

The engineering and system benefits of using direct steam (in situ) generation in line-focus collectors are assessed. The major emphasis of the analysis is a detailed thermal performance comparison of in situ systems (which utilize unfired boilers). The analysis model developed for this study is discussed in detail. An analysis of potential flow stability problems is also provided along with a cursory cost analysis and an assessment of freeze protection, safety, and control issues. Results indicated a significant thermal performance advantage over the more conventional oil and flash systems and the flow stability does not appear to be a significant problem. In particular, at steam temperatures of 220 C (430 F) under the chosen set of assumptions, annual delivered energy predictions indicate that the in situ system can deliver 15% more energy than an oil system and 12% more energy than flash system, with all of the systems using the same collector field. Further, the in situ system may result in a 10% capital cost reduction. DOE

N83-21569# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ENERGY-CONSERVING AND PASSIVE-SOLAR CONSTRUCTION DETAILS
R. D. Taylor Apr. 1982 29 p
(Contract DE-AC02-77CH-00178)
(DE82-014467; SERI/SP-721-1135R) Avail: NTIS HC A03/MF A01

Many cost effective solutions to the major passive solar concept problems that can be applied to a whole range of residential and light commercial buildings are presented. Some passive solar components are presented that were site built but which lend themselves to being manufactured and installed by building tradesmen. Twenty-four construction detail drawings are include. DOE

N83-21570# Boeing Co., Seattle, Wash.
SOLAR PROJECT DESCRIPTION FOR GILL HARROP BUILDERS SINGLE-FAMILY DETACHED RESIDENCE, BIG FLATS, NEW YORK
23 Apr. 1982 48 p
(Contract DE-AB01-76CS-31020)
(DE82-014984; SOLAR/1096-82/50) Avail: NTIS HC A03/MF A01

A house with approximately 1360 square feet of conditioned space heated by a direct gain system with manually operated insulated curtains is discussed. Solar heating is augmented by electric resistance heating, and a wood burning stove may be installed. Sunlight is admitted through both south facing windows and through clerestory collector panels and is absorbed and stored as heat in a concrete floor and wall. Heat is then distributed by natural convection and radiation. Temperature regulation is assisted by Earth beams. Three modes of operation are described: collector-to-storage, storage-to-space heating, and passive space cooling, which is accomplished by shading, movable insulation, and ventilation. The instrumentation for the National Solar Data Network is described. The solar energy portion of the construction costs is estimated. DOE

N83-21571# Foster-Miller Associates, Inc., Waltham, Mass.
DESIGN AND COMPONENT TESTING OF A LOW-TEMPERATURE WASTE-HEAT-DRIVEN REFRIGERATION SYSTEM, PHASES 1 AND 2 Progress Report
Scott Hynek, Hamed Borhanian, Ira Krepchin, David Walker, Charles Mariano, Henry Fuller, and Kangpil Lee Mar. 1982 301 p refs
(Contract W-7405-eng-26)
(DE82-014721; ORNL/Sub-80/28906/1) Avail: NTIS HC A14/MF A01

The design and the component testing of a 20 ton refrigeration system powered by 140 F waste heat was completed. A major advantage of such a system is that essentially all operating power comes from the waste heat with only minor injections of auxiliary power. This Rankine-Rankine system uses R-22 for both power and refrigeration cycles. A single semihermetic housing contains the expander, compressor, feed pump, and motor/generator. The integral induction motor/generator acts as a starter, makes up shaft power deficits, absorbs shaft power surpluses, and provides overspeed protection. Experiments determined that 0.0015 in. is the optimum axial clearance for the gerotor R-22 evaporator feed pump to minimize both friction and backleakage, that oil injection to the pump had no effect on either friction or backleakage, and that a centrifugal inducer was needed to prevent cavitation under certain operating conditions. DOE

N83-21572# Oak Ridge National Lab., Tenn.
USE OF VEGETATION TO AMELIORATE BUILDING MICROCLIMATES: AN ASSESSMENT OF ENERGY-CONSERVATION POTENTIALS
B. A. Hutchison, F. G. Taylor, and R. L. Wendt Apr. 1982 83 p refs
(Contract W-7405-eng-26)
(DE82-013255; ORNL/CON-87) Avail: NTIS HC A06/MF A01

The space-conditioning energy conservation potentials of landscapes designed to ameliorate building microclimates are evaluated. The physical bases for vegetative modifications of climate are discussed and results of past study of the effects of vegetation on space-conditioning energy consumption in buildings are reviewed. The state-of-the-art of energy-conserving landscape designs is assessed and recommendations are presented for further research. DOE

N83-21573# National Center for Resource Recovery, Washington, D. C.
INCREASING THE ENERGY YIELD FROM RESOURCE RECOVERY BY USE OF THE ORGANIC MATERIALS IN THE AIR-CLASSIFIER HEAVY FRACTION
Zahid Khan and Marc L. Renard Feb. 1982 87 p refs
(Contract DE-AC01-76CS-20167)
(DE82-011249; DOE/CS-20167/9) Avail: NTIS HC A05/MF A01

In many resource recovery plants, a basic unit operation is the separation, based on air classification, of a light stream and a heavy fraction. The study investigates the properties and possible use of this heavy fraction as a combustible and a source of aluminum. Based on representative heavy fraction samples from six US recovery plants, detailed analyses were performed of the combustible fraction, particle size distribution, composition, and other physical or chemical characteristics. Methods of processing and their costs were considered. Yields in heavy fraction ranged from 17 to 42 wt % of the incoming waste. Recovering the minus 13 mm fraction lowers these figures to 10 to 21 wt %, with a significant increase in heating value. In most cases, aluminum is worth recovering, even at low efficiencies (under 50%). The fraction remaining as fuel could be used in modular, semi-suspension fired or even fluidized bed combustors. DOE

N83-21574# General Electric Co., Philadelphia, Pa. Space Systems Div.
ENERGY-STORAGE-FLYWHEEL HOUSING-DESIGN-CONCEPT DEVELOPMENT
Anthony P. Coppa Sep. 1981 236 p refs
(Contract W-7405-eng-48)
(DE82-014494; UCRL-15448) Avail: NTIS HC A11/MF A01

A low cost vehicular flywheel housing conceptual design was obtained by resorting to well developed mass production sheet metal fabrication processes and inexpensive materials. Two versions of the design, based on different rotor sizes, are described. The rotors are of the General Electric hybrid type and have the following dimensions: 15 in. OD x 1.50 in. thickness and 18 in. OD x 1.00 in. thickness. Both rotors have a maximum operating energy capacity of 0.25 kw. hr and close to identical weight and energy density values of 16.0 lb. and 15.6 whr/lb respectively. A leading mass producer of sheet metal components for automotive

vehicles provided budgetary quotations for steel housings. Information is included on: the design analysis, results of rotor burst testing and the conceptual design requirements for containment vacuum, safe response to vehicle collision, noise suppression, and structural performance. DOE

N83-21575# Foster Wheeler Corp., Livingston, N.J.
AN INTERIM STRUCTURAL DESIGN STANDARD FOR SOLAR ENERGY APPLICATIONS. EVALUATION OF ANL TESTS Final Report
M. S. M. Rao Feb. 1982 71 p refs
(Contract DE-AC04-76DP-00789)
(DE82-008768; SAND-80-8193; FWDC-9-41-441110) Avail: NTIS HC A04/MF A01

The evaluation of tests on Type 316H stainless steel and Incoloy 800 is reported. The background and task description of the program are reviewed and the details of analyses are described. The results of evaluation of tests are discussed. The creep ratcheting strain of the zero hold-time tests was predicted by using the book and actual hardened material properties as measured from the tests. The mean stress shift for uniaxial strain cycling with hold-times in one direction was studied. An elastic-plastic-creep analysis was conducted for each hold-time test to determine the stress range and the extent of creep ratcheting by using the book and actual hardened material properties. The creep-fatigue life of each test was determined analytically by using the ASME Code. All the results were compared to the experimental data of the tests. DOE

N83-21576# Oak Ridge National Lab., Tenn.
EARTH-SHELTERED HOUSING: AN EVALUATION OF ENERGY-CONSERVATION POTENTIAL
R. L. Wendt Apr. 1982 49 p refs
(Contract W-7405-eng-26)
(DE82-013250; ORNL/CON-86) Avail: NTIS HC A03/MF A01

The Innovative Structures Program (ISP) began an evaluation of the energy conservation potential of earth sheltered houses. A comprehensive evaluation of earth sheltered housing is presented. The conclusions are more qualitative than quantitative in nature because of the limited information on which to base projections. The major conclusions to date are as follows: earth sheltered houses are capable of very good energy performance. Earth sheltered houses, as a passive means to conserve energy, perform significantly better in some climatic regions than in others. Earth sheltered houses are not the optimum passive concept in several major housing growth regions of the country. Earth sheltered houses, including their land and site improvements, will cost an estimated 10 to 35% more than comparable above ground houses, and this additional cost may not be justified on a life cycle cost basis, given 1981 market conditions. DOE

N83-21577# Central Wayne County Sanitation Authority, Dearborn Heights, Mich.
ENERGY RECOVERY AND COGENERATION FROM AN EXISTING MUNICIPAL INCINERATOR. PHASE 2A: FINAL DESIGN Progress Report
Feb. 1982 70 p
(Contract DE-FG01-79CS-20232)
(DE82-007911; DOE/CS-20232/2) Avail: NTIS HC A04/MF A01

A feasibility study was prepared on energy recovery and cogeneration from and existing municipal incinerator in Wayne County, Michigan. The mechanical, electrical, structural, and instruments an controls equipment designs were established in sufficient depth to arrive at a construction cost estimate. The designs are described. All of the flue gas generated from each incinerator is directed into a waste heat boiler that will generate steam. A waste heat boiler will be provided for each of the three incinerators. Steam from these waste heat boilers will supply energy to two turbine-generators, which, in turn, will supply auxiliary power to the incinerator plant; the balance of the power will be sold to Detroit Edison Company (DEC). Exhaust steam from each turbine will be directed into a surface condenser operating under vacuum. The water to be supplied to each condenser will be recirculated water that has been cooled by means of a cooling tower. DOE

N83-21578# Hague International, South Portland, Maine.
ENHANCEMENT OF ENERGY SAVINGS THROUGH ACCELERATED IMPLEMENTATION OF HIGH-PERFORMANCE FORGE FURNACES Final Technical Report
Feb. 1982 138 p refs
(Contract DE-FC01-80CS-40335)
(DE82-010913; DOE/CS-40335/T1) Avail: NTIS HC A07/MF A01

Hague International successfully demonstrated under both controlled and actual production conditions that a well designed slot forge furnace equipped with a ceramic recuperator could consume as much as 65% of the fuel normally consumed by a forging furnace. Thus the Department of Energy, entered into a cooperative agreement to accelerate the introduction of Hague International's high efficiency slot forge furnace into the forging industry. This report details the basis of the cooperative agreement and the history of the host sites covered by the agreement. Fifteen (15) host sites participated in the program. DOE

N83-21579# Arinc Research Corp., Annapolis, Md.
GUIDE FOR THE ASSESSMENT OF THE AVAILABILITY OF GASIFICATION-COMBINED-CYCLE POWER PLANTS Final Report
M. Neely Jan. 1982 79 p refs Sponsored by DOE and EPRI
(DE82-901905; EPRI-AP-2202) Avail: NTIS HC A05/MF A01

A guide that can be used for predicting the reliability and availability of coal gasification-combined-cycle (GCC) electric power generation units, as well as other electric power generation unit types is given. A prediction of plant effectiveness, a measure that can be directly related to availability, equivalent availability, forced-outage rate, and other performance measures is given. A seven-step availability assessment methodology that uses the concepts of unit states and state capabilities (the power output capability associated with each state) to produce predictions of a unit's effectiveness, availability, equivalent availability, critical components, and other measures of interest is given. As an illustration, the method is used to prepare an assessment of an 1150-megawatt baseload GCC plant that employs seven gas turbines, one steam turbine, and six oxygen-blown (Texaco) gasifiers. A complete data base of failure rates and mean downtimes for the GCC plant components and a documented computer program used for this analysis are also included. DOE

N83-21580# Middle South Services, Inc., New Orleans, La.
PRELIMINARY DESIGN STUDY OF COMPRESSED-AIR ENERGY STORAGE IN A SALT DOME. VOLUME 6: CAES PLANT DESIGN Final Report
Apr. 1982 215 p Prepared in cooperation with Brown Boveri Corp., Fenix and Scisson, Inc. and United Engineers and Constructors, Inc. Sponsored by EPRI
(Contract DE-AC01-77ET-29332; EPRI Proj. 1081-2)
(DE82-014355; EPRI-EM-2210-Vol-6) Avail: NTIS HC A10/MF A01

The preliminary plant design for a compressed air energy storage (CAES) plant is presented. The design is based upon the facility criteria; the specific site; and the systems, subsystems. The compressed air is stored in two solution mined caverns in the salt dome. The details concerning the major equipment and the operation of the mechanical systems are described. The project schedule from start of licensing to commercial operation is estimated to be 70 months, with actual construction (including dewatering of the caverns) estimated for 39 months. Based on the cost estimate developed in this task and the modified financial data and fuel cost projections, the economic introduction of CAES into the MSS system was examined for the No. 2 oil-fired plant. The economic analysis did not extend beyond the year 1988. The economic introduction of CAES in the MSS system before 1990 is unlikely because the older oil fired units in the MSS system may be economically used for cycling and peaking, if required.

For a system with a different composition of generating units, CAES may be economical at an earlier data. DOE

N83-21581# Institute for Energy Analysis, Oak Ridge, Tenn.
ELECTRIC HOME HEATING: SUBSTITUTION FOR OIL AND GAS
C. C. Burwell, W. D. Devine, Jr., and D. L. Phung Mar. 1982 201 p refs
(Contract DE-AC05-76OR-00033)
(DE82-013762; ORAU/IEA-82-3(M)) Avail: NTIS HC A10/MF A01

The objective of the research is to determine the potential for substituting electricity generated with surplus coal and nuclear capacity for gas and oil used for home heating. The relative effectiveness of electric heating was determined by an analysis of the purposes of extra winter sales of electricity to the residential sector compared to a similar analysis for extra winter sales of natural gas. The price of electricity for heating is determined based on utility rate structures for selected utilities (primarily located in the north and south central portions of the country) having surplus coal and nuclear capacity throughout the decade of the 1980s. It is found that, on the average, the overall efficiency of fuel use for heating homes electrically is comparable to the use of combustion systems in the home and that electric heating is substantially less costly than direct heating with oil in regions where coal and uranium are the primary fuels used for power generation. DOE

N83-21582# Sandia Labs., Livermore, Calif.
TESTING AND EVALUATION OF SECOND-GENERATION HELIOSTAT MIRROR MODULES
V. P. Burolla and W. R. Delameter Jan. 1982 140 p refs
(Contract DE-AC04-76DP-00789)
(DE82-007934; SAND-81-8263) Avail: NTIS HC A07/MF A01

The testing and evaluation of the second generation heliostat mirror modules are reported. It was found that all of the previous design problems of mirror modules, such as silver corrosion, thermal defocus, and high glass stress, were eliminated by one or more of these designs. The single most important conclusion to be drawn from this program is that laminated glass mirror module designs are the most technically conservative; it is recommended that this concept be used for near term applications. DOE

N83-21583# Chicago Univ., Ill. Enrico Fermi Inst.
ENGINEERING DEVELOPMENT STUDIES FOR INTEGRATED EVACUATED CPC ARRAYS Final Report, 19 Jan. 1981 - 18 Jan. 1982
R. Winston 23 Apr. 1982 50 p refs
(Contract DE-AC04-81AL-16223)
(DE82-013941; DOE/AL-16223/2) Avail: NTIS HC A03/MF A01

An evacuated tube concentrator which achieves respectable high temperature performance (100 C to 300 C) was developed. The design concept utilizes nonimaging CPC type concentration integrated into each tube by shaping the outer glass vacuum envelope. The detailed design, prototype fabrication and preliminary test measurements are reviewed. In addition the results of this first study specifically devoted to engineering development questions related to practical applications of this collector concept are summarized. Questions having to do with the deployment of medium to large area arrays, optimizations of the manifolding of individual tube panels, selected near term applications (with an emphasis on residential cooling based on Rankine driven chillers) and long term performance projections are addressed. DOE

N83-21584# Acurex Corp., Mountain View, Calif.
ADVANCED PHOTOVOLTAIC-TROUGH DEVELOPMENT
R. Spencer, K. Yasuda, and B. Merson Apr. 1982 204 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015646; SAND-82-7117) Avail: NTIS HC A10/MF A01

The scope of the work on photovoltaic troughs includes analytical studies, hardware development, and component testing. Various aspects of the system have been optimized and improvements have been realized, particularly in the receiver and reflecting surface designs. An empirical system performance model has been developed that closely agrees with measured system performance. This in-depth study of single-axis reflecting linear focus photovoltaic concentrators will be very beneficial in the development of improved models for similar systems as well as other photovoltaic concentrator designs. DOE

N83-21585# Sandia Labs., Albuquerque, N. Mex.
STRESS ANALYSIS OF SPHERICAL MIRROR PANELS
V. J. Parks (NRL) and R. J. Sanford (NRL) Apr. 1982 44 p refs
(Contract DE-AC04-76DP-00789)
(DE82-015656; SAND-82-7116) Avail: NTIS HC A03/MF A01

An experimental analysis is reported of the stresses that occur in elastically deformed, spherically curved glass mirrors for solar energy applications. Bending and membrane stresses generated in forming the glass and the effects of springback are analyzed. In addition, thermal stresses caused by focusing the Sun's rays on a small region of the mirrors are analyzed. Methods used in the analysis included the use of grids, photoelasticity, and strain gages. Results of the analysis are compared with a theoretical analysis performed by Shelltech Associates in a parallel effort. DOE

N83-21586# Woodard-Clyde Consultants, San Francisco, Calif.
MONITORING WELL SYSTEMS IN GEOTHERMAL AREAS
Ben E. Lofgren, Jack ORourke, Robert Sterrett, John Thackston, and Dale Fain 28 Jan. 1981 65 p refs
(Contract DE-AC07-76ID-01570)
(DE82-012770; EGG-2185) Avail: NTIS HC A04/MF A01

The ability to monitor the injection of spent geothermal fluids at reasonable cost might be greatly improved by use of multiple-completion techniques. Several such techniques, identified through contact with a broad range of experts from the groundwater and petroleum industries, are evaluated relative to application in the typical geologic and hydrologic conditions of the Basin and Range Province of the Western United States. Three basic monitor well designs are suggested for collection of pressure and temperature data: Single standpipe, multiple standpipe, and closed-system piezometers. The single standpipe piezometer is recommended for use at depths less than 152 m (500 ft); several can be clustered in one area to provide information on vertical flow conditions. At depths greater than 152 m (500 ft), the multiple-completion standpipe and closed-system piezometers are likely to be more cost effective. DOE

N83-21587# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
MATHEMATICAL MODELING OF THE BEHAVIOR OF GEOTHERMAL SYSTEMS UNDER EXPLOITATION Ph.D. Thesis
Gudmundur Svavar Bodvarsson Jan. 1982 377 p refs
(Contract W-7405-eng-48)
(DE82-010925; LBL-13937) Avail: NTIS HC A17/MF A01

Analytical and numerical methods were used to model the behavior of geothermal systems under exploitation. A new single-phase three-dimensional simulator, capable of solving heat and mass flow problems in a saturated, heterogeneous porous or fractured medium was developed. The simulator uses the integrated finite difference method for formulating the governing equations and an efficient spare solver for the solution of the linearized equations. In the theoretical studies, various reservoir engineering problems were examined. These include well-test analysis, exploitation strategies, injection into fractured rocks, and fault-charged geothermal reservoirs. DOE

N83-21588# Technecon Analytic Research, Inc., Philadelphia, Pa.
NATIONAL FORECAST FOR GEOTHERMAL RESOURCE EXPLORATION AND DEVELOPMENT WITH TECHNIQUES FOR POLICY ANALYSIS AND RESOURCE ASSESSMENT
Thomas A. V. Cassel, Glenn T. Shimamoto, Chris B. Amundsen, Peter D. Blair, William F. Finan, M. Richard Smith, and Robert H. Edelstein 31 Mar. 1982 168 p refs
(Contract DE-AC02-79ET-27242)
(DE82-014641; DOE/ET-27242/T2) Avail: NTIS

HC A08/MF A01

The background, structure and use of modern forecasting methods for estimating the development of geothermal energy are documented. The forecasting instrument may be divided into two sequential submodels. The first predicts the timing and quality of geothermal resource discoveries from an underlying resource base. The second submodel forecasts the rate and extent of utilization of geothermal resource discoveries. It is based on the joint investment behavior of resource developers and potential users as statistically determined from extensive industry interviews. It is concluded that geothermal resource development, especially for electric power development, will play an increasingly significant role in meeting energy demands. DOE

N83-21589# Associated Industrial Design, Martinez, Calif.
GEOTHERMAL FEASIBILITY STUDY FOR CITY OF SONOMA, CALIFORNIA FOUR MUNICIPAL BUILDINGS
1982 42 p
(Contract DE-FG06-79ET-27256)
(DE82-015115; DOE/ET-27256/T14) Avail: NTIS
HC A03/MF A01

Four buildings in the City of Sonoma, totaling approximately 31,150 square feet, were evaluated to determine the economic feasibility of converting the existing environmental control systems to water source heat pumps utilizing a natural geothermal heat sink. Presently, on the State Park's site, there exists a warm water well which produces 250 gallons per minute of water at 73 F. Based on utility rates forecast by Pacific Gas and Electric, installation of heat pumps in the City buildings at Sonoma does not appear to be attractive. The economic evaluation was continued until the year 2000. Pacific Gas and Electric is re-evaluating its rate forecasts and will issue a new forecast in April 1982. The high capital cost is due to retrofitting the heating, ventilating, and air conditioning equipment for the existing buildings. For a new installation, the concept of using heat pumps should be re-evaluated. DOE

N83-21590# Oregon Inst. of Tech., Klamath Falls. Geo-Heat Center.
GEOTHERMAL HEATING FACILITIES FOR FRONTIER INN, SUSANVILLE, CALIFORNIA
Mar. 1982 23 p
(Contract DE-FG06-79ET-27256)
(DE82-015114; DOE/ET-27256/T13) Avail: NTIS
HC A02/MF A01

A 38 unit motel composed of six major sections (coffee shop, A frame units, apartments, back units, two story units and office) was built over a number of years and exhibits widely varying types of construction. Space heating is provided by primarily electric resistance equipment with some propane use. Domestic hot water is provided primarily by propane with some electric resistance. The coffee shop uses fuel oil for both space and domestic hot water heating. A geothermal district heating system is being installed. Although the motel site is not located in the area of construction activity, it is expected that the pipeline will be extended. The potential of retrofitting the existing heating facilities at the inn to geothermal is studied. DOE

N83-21591# Department of Energy, Houston, Tex.
THE VARIABLE PRESSURE SUPERCRITICAL RANKINE CYCLE FOR INTEGRATED NATURAL GAS AND POWER PRODUCTION FROM THE GEOPRESSURED GEOTHERMAL RESOURCE
Fred L. Goldsberry Mar. 1982 49 p refs
(DE82-008957; NVO-240) Avail: NTIS HC A03/MF A01

A small-scale power plant cycle that utilizes both a variable pressure vaporizer (heater) and a floating pressure (and temperature) air-cooled condenser is described. Further, it defends this choice on the basis of classical thermodynamics and minimum capital cost by supporting these conclusions with actual comparative examples. The application suggested is for the geopressured geothermal resource. The arguments cited in this application apply to any process (petrochemical, nuclear, etc.) involving waste heat recovery. DOE

N83-21592# Oregon Inst. of Tech., Klamath Falls. Geo-Heat Center.
GEOTHERMAL GREENHOUSE HEATING FACILITIES FOR THE KLAMATH COUNTY NURSING HOME, KLAMATH FALLS, OREGON
Feb. 1982 20 p refs
(Contract DE-FG06-79ET-27256)
(DE82-015104; DOE/ET-27256/T31) Avail: NTIS
HC A02/MF A01

The Klamath County Nursing Home, located in Klamath Falls, Oregon, was constructed in 1976. The building of 55,654 square feet currently houses care facilities for approximately 120 persons. During the initial planning for the nursing home, the present site was selected primarily on the basis of its geothermal resource. This resource currently provides space and domestic hot water heating for the nursing home, Merle West Medical Center and the Oregon Institute of Technology. The feasibility of installing a geothermal heating system in a planned greenhouse for the nursing home is explored. The greenhouse system would be tied directly to the existing hot water heating system for the nursing home. DOE

N83-21593# Oregon Inst. of Tech., Klamath Falls. Geo-Heat Center.
DISTRICT-HEATING SYSTEM, LA GRANDE, OREGON
Jan. 1982 27 p refs
(Contract DE-FG06-79ET-27256)
(DE82-015102; DOE/ET-27256/T26) Avail: NTIS
HC A03/MF A01

The area suggested for district heating feasibility study encompassed slightly over 400 acres extending north and south from the geographic center of the city. This district was subdivided into 8 areas, which include the Grande Ronde Hospital, Eastern Oregon State College, La Grande school district, one institutional area, one commercial area and three residential areas. Basic space heating loads developed for the various areas after a survey by county personnel and computation using a computer program form the basis for this economic feasibility study. DOE

N83-21594# Oregon Inst. of Tech., Klamath Falls. Geo-Heat Center.
UTILIZATION OF WARM WELL WATER, EASTERN WASHINGTON STATE
Mar. 1982 19 p
(Contract DE-FG06-79ET-27256)
(DE82-015101; DOE/ET-27256/T25) Avail: NTIS
HC A02/MF A01

Utilizing the warm well water for a geothermal greenhouse heating system is highly economically feasible. This is based on using the 88 F water from Anderson Well No. 1 to heat greenhouses totaling approximately 10.6 acres. The additional investment of $640,000 above the cost for a conventional electric boiler system shows a rate of return of 48.3% on a 20 year life cycle analysis. The simple payback is 3 years. The 88 F well water is not warm enough for prawn (Macrobrachium rosenbergii) aquaculture, since water flow requirements are excessive to maintain the desired 80 F pond temperature. However, the water is warm enough to maintain a 60 F pond temperature for trout farming. Trout farming using the 88 F well water directly is probably not economically feasible due to high electrical pumping cost (34,626 per year) for the seven 1/2 acre ponds that could be heated. Trout farming using the 75 F effluent water from the 10.6 acre greenhouse to heat four 1/2 acre ponds may be economically feasible since the water booster pumping cost is low ($1189 per year). DOE

N83-21595# Oregon Inst. of Tech., Klamath Falls.
GEOTHERMAL-HEATING FACILITIES FOR CARSON ELEMENTARY SCHOOL AND WIND RIVER MIDDLE SCHOOL
Feb. 1982 29 p
(Contract DE-FG06-79ET-27256)
(DE82-015121; DOE/ET-27256/T23) Avail: NTIS
HC A03/MF A01

The structures and geothermal heating systems of two schools

are discussed. The feasibility of geothermal heating of schools is examined. DOE

N83-21596# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

ELECTRIC-UTILITY VALUE DETERMINATION FOR WIND ENERGY. VOLUME 2: A USER'S GUIDE

David Percival and James Harper Jan. 1982 121 p

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-010926; SERI/TR-732-604R-Vol-2) Avail: NTIS HC A06/MF A01

A method is described for determining the value of wind energy systems to electric utilities. It is performed by a package of computer models available that can be used with most utility planning models. The final output of these models gives a financial value (dollars per kW) of the wind energy system under consideration in the specific utility system. DOE

N83-21597# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

THE ACQUISITION OF WIND RIGHTS FOR WIND ENERGY DEVELOPMENT

R. J. Noun Mar. 1982 9 p refs Presented at the Wind/Solar Energy Conf., Kansas City, Mo., 5-7 Apr. 1982

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-009139; SERI/TP-254-1421R; CONF-820423-1) Avail: NTIS HC A02/MF A01

Identifying suitable sites for large wind machine clusters, or wind farms, requires more than finding a location with an adequate wind resource. Consideration must also be given to the question of how land use policies and regulations will affect the siting of wind system installations. In particular, the issue of acquiring wind rights or guaranteed access to the wind resource for electric power generation, will be vital to the development of wind energy. Several methods are examined for acquiring and preserving access to the wind resource and for dealing with related land use issues. DOE

N83-21598# Virginia Univ., Charlottesville.

COASTAL ZONE WIND ENERGY. PART 3: A PROCEDURE TO DETERMINE THE WIND POWER POTENTIAL OF THE COASTAL ZONE

M. Garstang, R. Pielke, and J. W. Snow Mar. 1982 49 p refs Prepared for Pacific Northwest Lab., Richland, Wash.

(Contract DE-AC06-76RL-01830)

(DE82-014334; PNL-3903-Pt-3) Avail: NTIS HC A03/MF A01

A stepwise procedure is presented for determining the seasonal and/or annual mean potential wind power density for any location on the East and Gulf coasts of the United States. The steps include reference to the dominant wind regimes and mean power densities already obtained to estimate the wind power potential of the location under consideration; methods to calculate the potential wind power distributions and steps to be taken to locate the best site in the area of interest. The method can be best applied where the atmospheric systems which produce most of the wind energy at the surface are relatively persistent. The method is least successful in areas where the wind field is highly variable. Applications of the complete method requires the use of an existing two or three dimensional mesoscale numerical model. DOE

N83-21599# United Technologies Research Center, East Hartford, Conn.

DEVELOPMENT OF AN OSCILLATING-VANE CONCEPT AS AN INNOVATIVE WIND-ENERGY-CONVERSION SYSTEM

Richard L. Bielawa Mar. 1982 114 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-012870; SERI/TR-98085-2) Avail: NTIS HC A06/MF A01

The practicality is investigated of an oscillating vane wind energy conversion system, which incorporated the bending torsion flutter characteristics of a cantilevered wing. The system, characterized by relatively large response amplitudes, employs a construction scheme based on the high fatigue strength characteristics of a composite material. Results are presented of experimental and analytic studies to provide technical data upon which we can assess the concept. Two variants of the concepts are examined: single vane and split vane configurations. The experimental results consist of the mechanical power generation and dynamic response and stress characteristics for a model having a span of approximately one meter. Two complementary analyses are described: (1) a linear flutter eigensolution to calculate conditions for self start and flutter response amplitude ratios; and (2) a nonlinear time history analysis to calculate output power characteristics. DOE

N83-21600# Mellon Corp., Davis, Calif.

DARRIEUS WIND-TURBINE AIRFOIL CONFIGURATIONS

Paul G. Migliore and John R. Fritschen Jun. 1982 24 p refs

(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)

(DE82-017099; SERI/TR-11045-1) Avail: NTIS HC A02/MF A01

The purpose was to determine what aerodynamic performance improvement, if any, could be achieved by judiciously choosing the airfoil sections for Darrieus wind turbine blades. Ten different airfoils, having thickness to chord ratios of twelve, fifteen and eighteen percent, were investigated. Performance calculations indicated that the NACA 6-series airfoils yield peak power coefficients at least as great as the NACA. Furthermore, the power coefficient-tip speed ratio curves were broader and flatter for the 6-series airfoils. Sample calculations for an NACA 63 sub 2-015 airfoil showed an annual energy output increase of 17 to 27% depending upon rotor solidity, compared to an NACA 0015 airfoil. An attempt was made to account for the flow curvature effects associated with Darrieus turbines by transforming the NACA 63 sub 2-015 airfoil to an appropriate shape. DOE

N83-21601# South Dakota School of Mines and Technology, Rapid City.

ENERGY FROM HUMID AIR

T. K. Oliver, W. N. Groves, and C. L. Grubber Jun. 1982 109 p refs

(Contracts DE-AC01-79ET-23052; EG-77-C-01-4042)

(DE82-017121; SERI/TR-211-1539) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

A cost effective process using a vortex mechanization of an expansion-compression cycle to convert the energy from humid air into mechanical work, which can be used to drive an electrical generation was investigated. A computer model was established and applied to the problem to estimate the system losses and performance potential of the concept. A machine design based on the concept is given. DOE

N83-21602# Aerospace Systems, Inc., Burlington, Mass.

ASI/PINSON 1-KILOWATT HIGH-RELIABILITY WIND SYSTEM DEVELOPMENT. PHASE 1: DESIGN AND ANALYSIS

R. B. Noll, N. D. Ham, H. M. Drees, and L. B. Nichol Mar. 1982 369 p refs Prepared in cooperation with Pinson Energy Corp. and Natural Power Inc.

(Contract DE-AC04-76DP-03533)

(DE82-016128; RFP-3046/2) Avail: NTIS HC A16/MF A01

A high reliability version of a vertical axis machine called the Cycloturbine were developed. The final design is a 15 ft diameter turbine with three straight 8 ft blades controlled by a tilt cam mechanism. The tilt cam mechanism controls blade cyclic pitch amplitudes in a manner similar to a helicopter swash plate. The turbine has a power coefficient of 0.4 at an optimum tip speed ratio of 3.0 which results in a rotational speed of 112 RPM in a 9m/sec wind. The electrical system provides 1 kW of 24 V dc power in a 9m/sec wind by means of a flux switching alternator. The electronic circuitry, designed with high reliability components, consists of a voltage regulator and a power rectifier. A dump load circuit is provided as an option. Two transient protection networks are included, one on the tower for the alternator and the other to protect circuitry in the control building. DOE

N83-21603# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Energy Measurements Group.

PERFORMANCE TESTING OF THE ACUREX SOLAR COLLECTOR MODEL 3001-03

Vernon E. Dudley and Robert M. Workhoven (Sandia National Labs., Albuquerque, N. Mex.) Mar. 1982 122 p refs
(Contract DE-AC04-76DP-00789)
(DE82-013389; SAND-80-0872) Avail: NTIS HC A06/MF A01

Results are summarized of tests conducted at the Collector Module Test Facility on an Acurex Model 3001-03 Parabolic Trough Concentrating Solar Collector. Test temperature range was 100 C to 300 C. Tests were conducted with the collector axis oriented east-west and again with the collector axis oriented north-south. Three collectors were tested: one using polished aluminum mirrors, one using glass mirrors, and another using an aluminized acrylic film mirror. DOE

N83-21604# Massachusetts Inst. of Tech., Cambridge.
PERFORMANCE CHARACTERISTICS AND DESIGN CRITERIA FOR THE THERMIC DIODE, A PASSIVE THERMOSYPHON SOLAR HEATING SYSTEM Final Report
B. Shawn Buckley [1982] 193 p refs
(Contract DE-AS02-77CS-34383)
(DE82-012455; DOE/CS-34383/A002) Avail: NTIS (US Sales Only) HC A09/MF A01; DOE Depository Libraries

A mathematical model developed into a computer simulation of the thermic diode is described. The computer model is divided into two principal sections that describe external and internal phenomena respectively. The timekeeping, data handling, calculation of solar angles of incidence on both horizontal and tilted surfaces, glazing effects, and simulation of the heating load are described. The modeling of the thermic diode includes heat flow calculations, and the derivation and solution of the partial differential equations in temperature. The validation of the model and comparison with active systems are discussed. The f chart method used to determine the most economical number of thermic diodes to use in a building is described. Monthly and yearly results of computer simulations for periods up to a year are summarized. Simulations were carried out for different cities, and also varying design and system installation for a given city to detect on performance. DOE

N83-21605# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT FOR CDC LIGHT MANUFACTURING BUILDING, SAN BERNARDINO, CALIFORNIA
Oct. 1982 23 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002529; SAND-81-7089/4) Avail: NTIS HC A02/MF A01

The data are presented that were accumulated during June at the intermediate photovoltaic project at the CDC Light Manufacturing Building, San Bernardino, California. Generated energy and environmental (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided. DOE

N83-21606# Boeing Computer Services, Inc., Seattle, Wash.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE REPORT FOR OKLAHOMA CENTER FOR SCIENCE AND ARTS FOR JUNE, JULY, AND AUGUST 1982
Nov. 1982 70 p refs
(Contract DE-AC04-76DP-00789)
(DE83-003668; SAND-81-7087/4) Avail: NTIS HC A04/MF A01

Presented are the data accumulated during June, July, and August at the intermediate photovoltaic project at Oklahoma Center for Science and Arts, Oklahoma City, Oklahoma. Generated energy and environmental for (weather) data are presented graphically. Explanations of irregularities not attributable to weather are provided. DOE

N83-21607# TriSolar Corp., Bedford, Mass.
DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM FOR PHOTOVOLTAIC RESIDENCES IN THE SOUTHWESTERN UNITED STATES Final Report
Alan Millner Aug. 1982 80 p Sponsored in part by MIT
(Contract DE-AC02-76ET-20279)
(DE83-002532; DOE/ET-20279/218) Avail: NTIS HC A05/MF A01

The intention of the project reported was to develop plans for an energy-efficient residence for the southwestern region of the country, and to design into it a roof-mounted photovoltaic (PV) solar electric power system which would allow two-way power flow between the utility grid and the house. A full-scale working prototype of the PV system was built to evaluate the performance of that system for one year. The residence design, the prototype construction, and the fabricaton history through the first year of operation are described. DOE

N83-21608# Sandia Labs., Albuquerque, N. Mex.
FINITE-ELEMENT ANALYSIS AND MODAL TESTING OF A ROTATING WIND TURBINE
T. G. Carne, D. W. Lobitz, A. R. Nord, and R. A. Watson Oct. 1982 16 p refs Previously announced as A82-30163
(Contract DE-AC04-76DP-00789)
(DE83-002609; SAND-82-0345) Avail: NTIS HC A02/MF A01

A finite element procedure, which includes geometric stiffening, and centrifugal and Coriolis terms resulting from the use of a rotating coordinate system, was developed to compute the mode shapes and frequencies of rotating structures. Special applications of this capability was made to Darrieus, vertical axis wind turbines. In a parallel development effort, a technique for the modal testing of a rotating vertical axis wind turbine is established to measure modal parameters directly. Results from the predictive and experimental techniques for the modal frequencies and mode shapes are compared over a wide range of rotational speeds. DOE

N83-21609# Southern Methodist Univ., Dallas, Tex. Dept. of Geological Sciences.
HEAT FLOW AND GEOTHERMAL POTENTIAL OF KANSAS
David D. Blackwell and John L. Steele 1981 81 p refs
(Contract DE-AS07-79ET-27204)
(DE83-003235; DOE/ET-27204/T1-Vol-1-Sect-2) Avail: NTIS HC A05/MF A01

Four deep hydrologic tests in Kansas were used for a geothermal study. These wells were drilled through the Arbuckle Group to within a few feet of basement and two of the holes were deepened on into the basement and core samples collected of the basement rock. Because of the depth of the four holes and because of the fact that they were cased through most of their depth and left undisturbed to reach temperature equilibrium, it is possible to get highly accurate, stable temperature measurements through the complete sedimentary section. In addition an extensive suite of geophysical logs were obtained for each of the holes (gamma-ray, travel time, density, neutron porosity, electric, etc.) and cuttings were collected at frequent intervals. In addition 5 other holes were logged for supplementary information on the temperature regime in other parts of Kansas. DOE

N83-21610# Louisiana State Univ., Baton Rouge.
USE OF TWIN WELLS AND WATER-SOURCE HEAT PUMPS FOR ENERGY CONSERVATION IN LOUISIANA
Raphael G. Kazmann Dec. 1981 73 p refs
(DE83-900349; NP-3900349; TR-9) Avail: NTIS HC A04/MF A01

The use of heat pumps and well water for energy conservation, is both safe and feasible in Louisiana. Two wells should be used alternately as the water source: one for production, one to return the water to the aquifer. The purpose is to eliminate any impact on ground-water levels and to prevent interference with other uses of the same aquifer. Tables are included for determining the spacing between the production and return wells for any combination of aquifer thickness, length of season, and rate of water production, so that returned water will not appear in the production stream. Economic analyses include residential, commercial and industrial applications for two parishes in Louisiana. All hydrogeological data needed for preliminary design are shown on maps. DOE

N83-21611# Oak Ridge National Lab., Tenn. Energy Div.
ADIABATIC ABSORPTION AND DESORPTION FOR IMPROVEMENT OF TEMPERATURE-BOOSTING ADSORPTION HEAT PUMPS
Gershon Grossman Nov. 1982 19 p refs
(Contract W-7405-eng-26)
(DE83-002589; ORNL/TM-8390) Avail: NTIS HC A02/MF A01

An improvement is reported in the conventional absorption heat pump cycle that allows for achieving an increased temperature boost and a better coefficient of performance (COP). The improvement is obtained by adding adiabatic absorption and desorption steps to the absorber and desorber of the system, respectively. The adiabatic processes make it possible to obtain the highest possible temperature in the absorber before any heat is removed from it and the lowest temperature in the desorber before heat is added to it. This, in turn, allows for efficient utilization of the thermodynamic availability of the heat supply stream. Compared to the conventional cycle, the improved system can operate with a larger difference between the high and low concentrations, less circulation losses, and a more efficient heat exchange. The concept of adiabatic absorption and desorption is described and compared for the conventional and improved cycles. Mathematical expressions are derived for the conditions at the adiabatic points, and design considerations are described for incorporating the improvements in a conventional system. Computer-generated performance curves of COP versus temperature boost are given for the heat pump to illustrate the performance enhancement by the diabatic process. DOE

N83-21612# Science Applications, Inc., La Jolla, Calif.
PROGRAM LISTING FOR HEAT-PUMP SEASONAL-PERFORMANCE MODEL (SPM)
30 Jun. 1982 130 p refs
(Contract DE-AC01-79CS-10757)
(DE83-002436; SAI-444-82-143-LJ) Avail: NTIS HC A07/MF A01

The computer program CNHSPM is listed which predicts heat pump seasonal energy consumption (including defrost, cyclic degradation, and supplementary heat) using steady state rating point performance and binned weather data. DOE

N83-21613# Sandia Labs., Albuquerque, N. Mex.
RESULTS OF THE PRDA 35 QUALIFICATION TESTS OF THE BDM CONCENTRATING PHOTOVOLTAIC MODULE
T. D. Harrison Aug. 1982 29 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002136; SAND-82-0732) Avail: NTIS HC A03/MF A01

During the period March 30 to October 30, 1981 two concentrators and eight module sections from an actively cooled, concentrating photovoltaic array were tested. Two different concentrators were used during the test program. Physical, electrical, and thermal characteristics as well as electrical performance data are presented. The effects of temperature cycling and freeze-thaw cycling exposure tests are given. Results presented revealed problems that are being corrected so that the module used to build the array will meet the qualification goals. DOE

N83-21614# Lamar Univ., Beaumont, Tex. Dept. of Mechanical Engineering.
VENTILATED WALL AND WINDOW TEST PASSIVE-SOLAR CONCEPT Final Report
Harry T. Mei 1 Feb. 1982 44 p refs Sponsored by Texas Energy and Natural Resources Advisory Council
(DE83-900824; TENRAC/EDF-063) Avail: NTIS HC A03/MF A01

The ventilated wall is composed of hollow blocks through which air may flow, a duct system with a fan, and for the pre-cooled vented wall, a system for circulating well water. The performance results of the pre-cooled vent wall are briefly summarized. A vented wall and roof configuration is also described. An economic analysis of the vented wall is presented. A facility for testing the performance of window designs and configurations is described, and the effectiveness of glass, multiple glazing, reflective glass, exterior appendages and interior appliances is discussed. DOE

N83-21615# Energy Engineering, Inc., Albuquerque, N. Mex.
ADDITIONAL TESTING OF THE PASSIVE HEAT-PIPE-COOLED SOLAR PHOTOVOLTAIC RECEIVER
K. T. Feldman, Jr. and D. D. Kenney Nov. 1982 55 p refs
(Contract DE-AC04-76DP-00789)
(DE-83-004474; SAND-81-7180) Avail: NTIS HC A04/MF A01

A heat exchanger which was designed to cool the cells in a linear concentrating solar photovoltaic module is described. The heat exchanger used an evaporating fluid to carry heat away from the surface, where cells would be mounted, and to a finned heat exchange surface. It was similar in operation to a heat pipe. It is concluded that this type of cooling is not a viable method for cooling photovoltaic cells. DOE

N83-21616# Syracuse Research Corp., N. Y. Energy Research Center.
EXTERIOR INSULATING SHUTTER FINAL PROTOTYPE DESIGN Final Report
Gregor A. Dike and Laurence F. Kinney Dec. 1982 123 p Sponsored in part by the New York State Energy Research and Development Authority
(Contract DE-FC02-80CS-30584)
(DE83-004520; SRC-TR-82-862; DOE/CS-30584/2) Avail: NTIS HC A06/MF A01

The final prototype shutter described uses sliding panels composed of inch thick thermax sandwiched between 60 mil thick ultraviolet resistant plastic on the outside, and 20 mil styrene on the inside. The shutter system was shown to have an effective R value of 6 using ASHRAE procedures to convert from still air conditions to 15 mph wind conditions in a simulated cold environment. Tests were performed for cyclical operation, vulnerability to ice and wind, thermal performance, and air infiltration. Marketing efforts are described. Cost effectiveness is determined via present value analysis. DOE

N83-21617# California Univ., Berkeley. Lawrence Berkeley Lab. Building Ventilation and Indoor Air Quality Program.
RESIDENTIAL AIR-TO-AIR HEAT EXCHANGERS: A STUDY OF THE VENTILATION EFFICIENCIES OF WALL- OR WINDOW-MOUNTED UNITS
Francis J. Offerman, William J. Fisk, Brian Pedersen, and Kenneth L. Revzan Sep. 1982 41 p refs
(Contract DE-AC03-76SF-00098)
(DE83-004752; LBL-14358; EEB-Vent-82-14) Avail: NTIS HC A03/MF A01

Mechanical ventilation systems with air-to-air heat exchangers can be installed into residences to provide energy efficient supplementary ventilation for the purpose of controlling indoor concentrations of contaminants, odors, and moisture. Wall or window-mounted units are particularly attractive because they are relatively inexpensive and easy to install. However, because they lack an air distribution system, concern arose over their ventilation performance. To address this concern, a series of experiments was conducted on two different models of wall- or window-mounted heat exchangers in two multi-room research facilities. The nominal ventilation efficiencies of these units was determined by measurement of tracer gas decay rates at several indoor locations to be in the range of 0.44 or 0.65. No significant correlations between nominal ventilation efficiency and heat exchanger model or operational strategies were observed. Significantly higher local ventilation efficiencies were noted in the rooms where the heat exchangers were operating. Some preliminary tests indicate that internal leakage between the airstreams contributes significantly to the ventilation inefficiency of these systems. DOE

N83-21618# Science Applications, Inc., McLean, Va.
ASSESSMENT OF DISTRIBUTED SOLAR POWER SYSTEMS: ISSUES AND IMPACTS Final Report
R. A. Moyle, H. Chernoff, T. C. Schweizer, and J. B. Patton (Systems Control, Inc., Palo Alto, Calif.) Nov. 1982 174 p refs Sponsored

by EPRI
(EPRI Proj. 1995-1)
(DE83-900640; EPRI-AP-2636) Avail: NTIS HC A08/MF A01

The installation of distributed solar-power systems presents electric utilities with a host of questions. Some of the technical and economic impacts of these systems are discussed. Among the technical interconnect issues are isolated operation, power quality, line safety, and metering options. Economic issues include user purchase criteria, structures and installation costs, marketing and product distribution costs, and interconnect costs. An interactive computer program that allows easy calculation of allowable system prices and allowable generation-equipment prices was developed as part of this project. It is conciuded that the technical problems raised by distributed solar systems are surmountable, but their resolution may be costly. The stringent purchase criteria likely to be imposed by many potential system users and the economies of large-scale systems make small systems (less than 10 to 20 kW) less attractive than larger systems. Utilities that consider life-cycle costs in making investment decisions and third-party investors who have tax and financial advantages are likely to place the highest value on solar-power systems. DOE

N83-21619# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Satellite Power Systems.
ELECTRIC POWER FROM ORBIT: A CRITIQUE OF A SATELLITE POWER SYSTEM
National Academy Press 1981 357 p refs
(Contract DE-AI01-80ER-10159; Grant NSF PRM-81-83080)
(DE83-002771; DOE/ER-10159/T1; LC-81-83080;
ISBN-0-309-03183-4) Avail: NTIS HC A16/MF A01

A Satellite Power System (SPS) which would consist of a number of huge satellites moving in geosynchronous orbit and collecting solar energy for conversion and transmission to Earth is outlined. Focussing on a reference system, the concept is critiqued in terms of: technological aspects, economic aspects, environmental effects, sociopolitical factors, comparison with other long term technologies. It is recommended that no funds be committed to developing an SPS, but that progress in new technologies that would be important to the practicality and timeliness of an SPS should be reviewed and reported to Congress. Supporting information is included on space systems, solar cells, microwave energy transmission, dosimetry, long term effects of low level radiation on people, and electromagnetic compatibility. DOE

N83-21620# Midwest Research Inst., Golden, Colo. Thermal Systems and Engineering Branch.
DESIGN APPROACHES FOR SOLAR INDUSTRIAL PROCESS-HEAT SYSTEMS: NONTRACKING AND LINE-FOCUS COLLECTOR TECHNOLOGIES
Charles F. Kutscher, Roger L. Davenport, Douglas A. Dougherty, Randy C. Gee, P. Michael Masterson, and E. Kenneth May Aug. 1982 457 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE83-003339; SERI/TR-253-1356) Avail: NTIS HC A20/MF A01

The design methodology for solar industrial process heat systems is described, and an overview is given of the use of solar energy in industry. A way to determine whether solar energy makes sense for a particular application is described. The basic system configurations used to supply hot water or steam are discussed, and computer generated graphs are supplied that allow the user to select a collector type. Energy calculations are provided, including the effects of thermal losses and storage. The selection of subsystem components is described, and control systems, installation and start up details, economics, and safety and environmental issues are explained. DOE

N83-21621# Holmes and Narver, Inc., Las Vegas, Nev. Energy Support Div.
COLADO GEOTHERMAL RESOURCE ASSESSMENT: SHALLOW-HOLE TEMPERATURE SURVEY: INTERMEDIATE-DEPTH HOLES IGH NO. 1 AND NO. 2; DEPTH TEST HOLE 44X-10 Final Report
Nile O. Jones Sep. 1982 70 p Sponsored in part by Getty Oil Co.
(Contracts DE-AC08-76NV-00020; DE-AC08-79ET-27008)
(DE83-002898; HN-00020-1098) Avail: NTIS HC A04/MF A01

The Getty Oil Company began the field work on a government cost-sharing venture to assess the geothermal potential in the Colado area of Pershing County, Nevada. Eighteen shallow (500-foot) temperature gradient holes, two intermediate (1500-foot) temperature gradient holes and one deep (8000-foot) exploratory well were drilled. All field work was completed in May 1981. Maximum temperature achieved was 2820 F at 7064 feet. No fluid reservoir was encountered with this hole. DOE

N83-21622# Pacific Northwest Lab., Richland, Wash.
THE WAKE OF THE MOD-OA1 WIND TURBINE AT TWO ROTOR DIAMETERS DOWNWIND ON DECEMBER 3, 1981
J. R. Connell and R. L. George Nov. 1982 61 p refs
(Contract DE-AC06-76RL-01830)
(DE83-003305; PNL-4210) Avail: NTIS HC A04/MF A01

The wake of the MOD-OA1 wind turbine at Clayton, New Mexico was measured using a vertical plane array of anemometers in a crosswind plane at distance of two rotor diameters directly downwind of the turbine. Rotor blade vortices were well mixed into the wake turbulence and were not separately detectable. Wake swirl about the along-wind axis had a value not greater than 0.025 rad/s. Extra turbulence energy existed in the edge of the wake at a frequency of about n=0.025 Hz. The cross-wake plane analyses of wind speeds revealed a nearly circular inner portion and a strongly elliptical portion. The elliptical portion major axis was horizontal. An estimate of the average rate of reenergizing of the wake, using measurements of mean wind energy flow and turbine power, suggests that entrainment with ambient air may be rapid. Some wake characteristics were compared with the corresponding ones for several simple wake models based upon concepts of mixing of ambient air into a wake or an equivalent coaxial jet. DOE

N83-21623# Aluminum Co. of America, Alcoa Center, Pa.
DEVELOPMENT AND DEMONSTRATION OF PROCESS AND COMPONENTS FOR THE CONTROL OF ALUMINUM-AIR-BATTERY ELECTROLYTE COMPOSITION THROUGH THE PRECIPITATION OF ALUMINUM TRIHYDROXIDE Final Report
Lawrence Livermore Lab. 11 May 1982 382 p refs Prepared for Lawrence Livermore Lab., Calif.
(Contract W-7405-eng-48)
(DE83-002490; UCRL-15503) Avail: NTIS HC A17/MF A01

Physical property data on density, viscosity, and electrical conductivity were developed and reduced to correlation form for synthetic electrolytes containing nominally 7 g/L Sn and 0.20 g/L Ga in 3,4,5,6 M NaOH. Concentrations of Al(OH)4 were selected at six levels for each NaOH concentration and ranged from 0 to as high as 4 M Al(OH)4 at 6 M NaOH. The effect of the Sn and Ga impurities was the increased density by a relatively small percentage, increased viscosity by a significant percentage, and decreased electrical conductance by a significant percentage. Precipitation rate was negatively affected by tin in solution, with a 40% reduction in the rate constant. Both Sn and Ga coprecipitated with the Al(OH)3 to an extent strongly dependent on temperature. Very high precipitation rates resulted in Na levels in product exceeding the target level of 0.24% Na on the hydrate basis. The incorporation of Na in product was also a strong function of temperature. A total of 108 computer simulations were performed and documented to delineate the region of feasible operation with respect to meeting the aluminate production specification. A full scale precipitator was operated in a continuous mode to assess production rate, population changes with time, and hardware aspects. DOE

N83-21624# Wisconsin Univ., Madison. Engineering Experiment Station.
SUPERCONDUCTIVE ENERGY STORAGE Final Report, 1 Jan.

1976 - 30 Sep. 1981
R. W. Boom 30 Sep. 1982 43 p refs
(Contract DE-AC02-76ET-26602)
(DE83-002270; DOE/ET-26602/35) Avail: NTIS HC A03/MF A01

Superconductive Magnetic Energy Storage (SMES) research and development for DOE from 1976-1981 has advanced the design of SMES from one deep tunnel to a 15 tunnel hour-glass design to the present low aspect ratio surface trench large diameter storge solenoid. This final report, which refers to all previous detailed reports and publications, concentrates on the last design of 1981, the low aspect ratio design. The SMES project is an ongoing project which includes the continuous development of designs and components. This report describes conceptual designs and the current state of development for the conductor, struts and cryogenics. Two companion efforts, rock mechanics and electrical systems, have been supported by the Wisconsin Utilities and are given less coverage here, although many references are listed in the 176-item bibliography. The present state of the project is that $15 million dollars is needed to take the next step. The work to be done is to improve the design, complete the component developments, design and test fabrication equipment and undertake credible cost estimates. DOE

N83-21625# Olin Corp., Stamford, Conn.
MANUFACTURE, DISTRIBUTION, AND HANDLING OF NITRATE SALTS FOR SOLAR-THERMAL APPLICATIONS
L. C. Fiorucci and S. L. Goldstein Nov. 1982 125 p refs Prepared in cooperation with Sandia Labs, Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE83-003317; SAND-81-8186) Avail: NTIS HC A06/MF A01

The low cost and attractive physical properties of molten sodium/potassium nitrate salts were shown to be one of the most cost effective fluids for heat absorption and thermal energy storage in Solar Central Receiver (SCR) systems. Information related to the availability, transport, handling, and utilization of these salts for commercial size SCR applications is provided. The following items are reviewed: existing manufacturing processes for natural and synthetic nitrates; the upstream availability of raw materials; downstream existing and projected demand for these products in other sectors of the economy; and relevant handling and distribution technologies. Safety considerations and issues more directly related to the SCR facility, such as initial system charging, salt maintenance and regeneration, and disposal are also reviewed. Options for supply, surge storage, and initial charging are discussed for the 1 MWt to 300 MWe range of solar plant sizes. DOE

N83-21626# Oak Ridge National Lab., Tenn. Energy Div.
PERFORMANCE AND ECONOMICS OF RESIDENTIAL SOLAR SPACE HEATING
Floyd J. Zehr (Westminster Coll., New Wilmington, Pa.), Teresa A. Vineyard, Richard W. Barnes, and Dennis L. ONeal Nov. 1982 224 p refs
(Contract W-7405-eng-26)
(DE83-003187; ORNL/CON-70) Avail: NTIS HC A10/MF A01

The performance and economics of residential solar space heating were studied for various locations in the contiguous United States. Common types of active and passive solar heating systems were analyzed with respect to an average-size, single-family house designed to meet or exceed the thermal requirements of the Department of Housing and Urban Development Minimum Property Standards (HUD-MPS). The solar systems were evaluated in seventeen cities to provide a broad range of climatic conditions. Active systems evaluated consist of air and liquid flat plate collectors with single- and double-glazing: passive systems include Trombe wall, water wall, direct gain, and sunspace systems. The active system solar heating performance was computed using the University of Wisconsin's F-CHART computer program. The Los Alamos Scientific Laboratory's Solar Load Ratio (SLR) method was employed to compute solar heating performance for the passive systems. Heating costs were computed with gas, oil, and electricity as backups and as conventional heating system fuels. DOE

N83-21627# Research Triangle Inst., Research Triangle Park, N.C.
PHOTOVOLTAIC CELL AND MODULE STATUS ASSESSMENT. VOLUME 2: TECHNOLOGY BASIS. Final Report
J. W. Harrison Oct. 1982 167 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1975-1)
(DE83-900575; EPRI-AP-2473-Vol-2) Avail: NTIS HC A08/MF A01

A series of in-depth appendices covers the basics of photovoltaic technology, including: the nature and availability of sunlight, physical basis of photovoltaic cell operation, basic photovoltaic cell design features, photovoltaic cell equivalent circuits and parameters, photovoltaic cell design for applications, photovoltaic cell fabrication technologies, cell test methods, flat-plate module design, flat-plate module fabrication, flat-plate module performance testing, concentrator module design, concentrator module development and evaluation, a glossary, and a list of manufacturers of photovoltaic cells, modules, and systems. DOE

N83-21628# Utah Univ., Salt Lake City. Earth Science Lab.
GEOTHERMAL DIRECT HEAT PROGRAM ROUNDUP, VOLUME 1
Carl A. Ruscetta, ed. Jul. 1982 317 p refs Proceedings of the Geothermal Energy Exploration and Resource Assessment Tech. Conf., Salt Lake City, 5-7 Apr. 1982
(Contract DE-AS07-28365)
(DE82-019912; DOE/ID-12079/71-Vol-1; ESL-98-Vol-1; CONF-820491-Vol-1) Avail: NTIS HC A14/MF A01

Geothermal resources and utilization in several states are discussed. Studies of heat transmission, volcano-tectonic patterns, exploration and drilling, and geochemistry are given. DOE

N83-21629# Reynolds Metals Co., Richmond, Va. Dept. of Applied Chemistry and Physics.
EFFECT OF MANGANESE ADDITIONS ON THE PERFORMANCE OF ALUMINUM AIR-BATTERY ANODE ALLOYS Progress Report
Darwin H. Scott 5 May 1982 43 p
(Contract W-7405-eng-48)
(DE83-002277; UCRL-15473; MR-82-14) Avail: NTIS HC A03/MF A01

Electrochemical evaluation of the experimental alloys previously cast indicated that the coulombic efficiency of an aluminum anode alloy with a nominal chemistry of 0.04% Fe, 0.04% Ga, and 0.8% Mg could be substantially improved by a 0.04% Mn addition. More recent electrochemical testing of ingot sections showed that the performance of an aluminum anode alloy, based on a nominal 0.04% Fe, could be improved by a high temperature homogenization. Based on these results, it was decided that the addition of manganese offered a very fruitful approach for providing improved anode performance. Thus the intent of the current work was to further investigate the effects of varying manganese/iron ratios and fabrication practices on the electro-chemical performance of an aluminum anode alloy containing a nominal 0.04% Fe. Results are presented and discussed. DOE

N83-21630# Oak Ridge National Lab., Tenn. Energy Div.
PERFORMANCE AND ECONOMICS OF 8 ALTERNATIVE SYSTEMS FOR RESIDENTIAL HEATING, COOLING, AND WATER HEATING IN 115 US CITIES
E. A. Nephew and L. A. Abbatiello Nov. 1982 249 p refs
(Contract W-7405-eng-26)
(DE83-003196; ORNL/CON-89) Avail: NTIS HC A11/MF A01

The effects of 1981 costs and technology on the performance and economics of five electrically driven heating, ventilating, air-conditioning, and water-heating systems for residences are discussed. Current life-cycle costs and annual efficiencies are presented for 115 cities in the United States for each of the following residential systems: an electric furnace, central air conditioner, and electric resistance water heater; a high-performance air-to-air heat pump with electric resistance water heater; a high-performance air-to-air heat pump with desuperheater

water heater; a minimum annual cycle energy system (ACES) of the brine-chiller type; a full ACES of the brine-chiller type; an advanced gas furnace, central air conditioner, and gas water heater; an oil furnace, central air conditioner, and electric resistance water heater; and a pulse gas furnace, central air conditioner, and gas water heater. Of the electrically driven systems, the full ACES is found to exhibit the highest annual efficiency and the highest life-cycle costs for most regions of the nation. The gas furnace system generally exhibits lower life-cycle costs. DOE

N83-21631# Pacific Northwest Lab., Richland, Wash.
EVALUATION OF AMMONIA AS A WORKING FLUID FOR A WET/DRY-COOLED BINARY GEOTHERMAL PLANT
M. K. Drost and H. D. Huber Oct. 1982 36 p refs
(Contract DE-AC06-76RL-01830)
(DE83-002895; PNL-4068) Avail: NTIS HC A03/MF A01

The concepts considered involve various arrangements of the binary geothermal power cycle with advanced dry cooling schemes. Brief descriptions of the binary cycle and advanced cooling schemes are included. Also included are descriptions of the base case concept and the ammonia working fluid concept. Performance and cost estimates were developed for a wet cooled isobutane cycle plant, wet/dry cooled isobutane cycle plant, wet cooled ammonia cycle plant, and a wet/dry cooled ammonia cycle plant. The performance and cost estimates were calculated using the GEOCOST computer code. The characteristics of the wet/dry cooling system were determined using the BNWGEO computer code. Results of the cooling system analysis are presented, followed by results of the geothermal plant analysis. Conclusions and comments also are included. DOE

N83-21632# Vetter Research, Costa Mesa, Calif.
REINJECTION AND INJECTION OF FLUIDS IN GEOTHERMAL OPERATIONS (STATE OF THE ART)
O. J. Vetter and V. Kandarpa 5 Nov. 1982 101 p refs
(Contract DE-AC03-78ET-27146)
(DE83-001857; DOE/ET-27146/T17; VR-82-05-11) Avail: NTIS HC A06/MF A01

A summary of the problems associated with reinjection of heat-depleted brines and injection of other fluids such as imported brines and gases is presented. Covered are only injection and reinjection problems which are related to the exploitation of liquid-dominated resources by flash-cycle power plants. Suggestions which may offer solutions to many of the identified problems are also covered. In addition, some ideas that should or could be implemented in planning of implementing and/or executing any new geothermal injection operation are described. DOE

N83-21633# Pacific Northwest Lab., Richland, Wash.
COMPARISON OF MODEL AND OBSERVATIONS OF THE WAKE OF A MOD-0A WIND TURBINE
J. C. Doran and K. R. Packard Oct. 1982 38 p refs
(Contract DE-AC06-76RL-01830)
(DE83-002882; PNL-4433) Avail: NTIS HC A03/MF A01

A series of wind velocity measurements upwind and downwind of the MOD-0A wind turbine at Clayton, New Mexico, was used to determine some of the characteristics of wakes within approximately two blade diameters of the machine. The magnitudes and shapes of the velocity profiles downwind of the turbine were compared with results obtained from a model. Generally good agreement was obtained at speeds well below the rated speed of the MOD-0A, but the results were not as satisfactory for higher values. DOE

N83-21634# Varian Associates, Palo Alto, Calif. Solid State Lab.
DESIGN AND DEMONSTRATION OF A SPECTRUM-SPLITTING PHOTOVOLTAIC CONCENTRATOR MODULE
P. G. Borden, P. E. Gregory, and O. E. Moore Nov. 1982 63 p refs
(Contract DE-AC04-76DP-00789)
(DE83-003669; SAND-82-7120) Avail: NTIS HC A04/MF A01

A spectrum splitting, concentrating photovoltaic module has been designed and fabricated that uses point focus curved facet Fresnel lenses to concentrate incident sunlight. The concentrated sunlight beam spectrum is split into a high and low energy part by a dichroic filter. The high energy part of the spectrum is transmitted to an AlGaAs solar cell and the low energy part is reflected to a Si cell. Spectrum splitting and using cells that respond best to the two parts of the spectrum splitting and using cells that respond best to the two parts of the spectrum gives a higher efficiency than the use of either cell alone. The experimental module has been tested which consists of 10 AlGaAs and 10 Si cells, and a sunlight to electricity conversion efficiency of 20% has been measured. DOE

N83-21635# Argonne National Lab., Ill. Energy and Environmental Systems Div.
RELIABILITY AND DESIGN GUIDELINES FOR COMBINED SOLAR-SPACE-HEATING AND DOMESTIC HOT-WATER SYSTEM
R. M. Wolosewicz and Josip Vresk Jul. 1982 79 p refs
(Contract W-31-109-eng-38)
(DE83-003341; ANL/SDP-12) Avail: NTIS HC A05/MF A01

Concepts of combined solar space-heating and domestic hot water (DHW) systems, and techniques for development of such systems are summarized for engineers and designers. Minimum instrumentation requirements for determining whether such system are operating properly are discussed, as are start-up and trouble shooting. Flat plate and tubular collector modules and generic drain-back systems that use them are analyzed by means of block-type reliability diagrams. System reliability results, based on a 6 h/d duty cycle, are given for five collector array sizes, in terms of mean time between failures. The duty-cycle analysis approach can be similarly applied to other operating cycles. DOE

N83-21636# Los Alamos Scientific Lab., N. Mex.
USE OF HOT-DRY-ROCK GEOTHERMAL RESOURCES FOR SPACE HEATING: A CASE STUDY
R. G. Cummings, C. J. Arundale, R. L. Bivins, H. S. Burness, R. H. Drake, and R. D. Norton Sep. 1982 89 p refs
(Contract W-7405-eng-36)
(DE83-002947; LA-9541-MS) Avail: NTIS HC A05/MF A01

A hot dry rock (HDR) geothermal space heat system proposed for the National Aeronautics and Space Administrations's Wallops Flight Center (WFC) will cost $10.9 million, saving $4.1 million over the existing oil heating system over a 30-yr lifetime. The minimal, economically feasible plan for HDR at WFC is shown to be the design of a single-fracture reservoir using a combined HDR preheat and a final oil burner after the first 4 years of operation. The WFC cost savings generalize and range from $3.1 million to $7.2 million for other HDR sites having geothermal temperature gradients ranging from 250C/km to 400C/km and depths to basement rock of 2400 ft or 5700 ft compared to the 300C/km and 9000 ft to basement rock at WFC. DOE

N83-21637# Mission Research Corp., Albuquerque, N. Mex.
ELECTRICAL OVERSTRESS FAILURE IN SILICON SOLAR CELLS Final Report
R. L. Pease, J. R. Barnum, V. A. J. vanLint, W. V. Vulliet, and T. F. Wrobel (Sandia Labs., Albuquerque, N. Mex.) Nov. 1982 229 p refs
(Contract DE-AC04-76DP-00789)
(DE83-004475; SAND-82-7128; ARMC-R-358) Avail: NTIS HC A11/MF A01

A solar-cell electrical-overstress-failure model and the results of experimental measurements of threshold pulsed failure currents on four types of silicon solar cells are presented. The transient electromagnet pulse field surrounding a lightning stroke was identified as a potential threat to a photovoltaic array, yet failure analysis of solar cells in a pulsed environment had not previously been reported. Failure in the low-resistivity concentrator cells at pulse widths between 1 SIGMA and 1 ms occurred initially in the junction. Finger damage in the form of silver melting occurs at currents only slightly greater than that required for junction damage. The result of reverse-bias transient-overstress tests on high-

resistivity (10 LAMBDA cm) cells demonstrated that the predominant failure mode was due to edge currents. These flat-plate cells failed at currents of only 4 to 20 A, which is one or two orders of magnitude below the model predictions. It thus appears that high-resistivity flat-plate cells are quite vulnerable to electrical overstress which could be produced by a variety of mechanisms. DOE

N83-21638# Mitre Corp., McLean, Va.
NATIONAL IMPLICATIONS OF HIGH SOLAR AND BIOMASS ENERGY GROWTH. A TECHNOLOGY ASSESSMENT OF SOLAR ENERGY SYSTEMS. THE TASE PROJECT Final Report
Yale M. Schiffman and Gregory DAlessio Sep. 1982 455 p refs
(Contract DE-AC01-80EV-10354)
(DE83-004935; MTR-82W54) Avail: NTIS HC A20/MF A01

A comprehensive multi-year analysis of the environment, resource and community impacts which could result in the year 2000 if major national of solar and biomass units, and the potential reductions in the impacts of new conventional technologies which they would displace. In addition, the indirect pollution impacts associated with the manufacturing of solar systems at greater and lesser rates are dicussed. Overall, massive incentives for solar and biomass energy over the next 20 years can lead to major stress on national capital and finished materials resources as well as to significant air pollution and safety problems. Rapid growth rates for solar systems could markedly increase energy demand in the manufacturing sector. The capital resource and materials problems would derive from emphasis on high, near term growth of solar technologies. DOE

N83-21639# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
FUNDAMENTAL HEAT-TRANSFER PROCESSES RELATED TO PHASE-CHANGE THERMAL-STORAGE MEDIA
E. M. Sparrow Dec. 1982 12 p
(Contract DE-AC02-79ER-10343)
(DE83-002205; DOE/ER-10343/04) Avail: NTIS HC A02/MF A01

Research performed on fundamental heat transfer processes which occur in phase-change thermal storage systems is described. The research encompasses both freezing and melting, and includes both experiment and analysis. The experimental portion of the work in progress is concerned with phase change which occurs within a closed cylinder or tube. In separate but interrelated freezing and melting experiments, the effect of the inclination of the tube in the gravity field was investigated. For freezing, it was found that despite local variations, the global (i.e., surface-averaged) freezing rate was virtually independent of the inclination of the tube. On the other hand, for melting, different regimes characterized by different melting rates were encountered as a function of the tube inclination. The rate of melting is least when the tube is vertical. At moderate angles relative to the vertical, gravity presses the melting solid against the tube, thereby accelerating the rate at which melting occurs. DOE

N83-21640# Pacific Northwest Lab., Richland, Wash.
ANALYTICAL MODELING OF A HYDRAULICALLY-COMPENSATED COMPRESSED-AIR ENERGY-STORAGE SYSTEM
C. A. McMonagle and D. S. Rowe (Rowe and Assoc., Inc.) Dec. 1982 75 p refs
(Contract DE-AC06-76RL-01830)
(DE83-005708; PNL-3374) Avail: NTIS HC A04/MF A01

A computer program was developed to calculate the dynamic response of a hydraulically-compensated compressed air energy storage (CAES) system, including the compressor, air pipe, cavern, and hydraulic compensation pipe. The model is theoretically based on the two-fluid model in which the dynamics of each phase are presented by its set of conservation equations for mass and momentum. The conservation equations define the space and time distribution of pressure, void fraction, air saturation, and phase velocities. The phases are coupled by two interface equations. The first defines the rate of generation (or dissolution) of gaseous air in water and can include the effects of supersaturation. The second defines the frictional shear coupling (drag) between the gaseous air and water as they move relative to each other. The relative motion of the air and water is, therefore, calculated and not specified by a slip or drift-velocity correlation. The total CASE system is represented by a nodal arrangement. The conservation equations are written for each nodal volume and are solved numerically. DOE

N83-21641# Arizona Univ., Tucson. Dept. of Chemical Engineering.
IRRIGATION PUMPING USING GEOTHERMAL ENERGY
Don H. White and Larry A. Goldstone Aug. 1982 62 p refs Sponsored in part by Arizona Solar Energy Commission
(Contract DE-FC03-80RA-50076)
(DE83-005308; DOE/RA-50076/10) Avail: NTIS HC A04/MF A01

The potential of using geothermal energy in an isobutane binary system to drive directly a cluster of irrigation pumps was evaluated. This three well geothermal system, based at 1500 C (3020 F) resource at 2000 m (6560 ft), would cost an estimated $7,800,000 in capital investment to provide 6000 gpm of irrigation water from 12 water wells. It would serve approximately 4.5 square miles of irrigated agricultural land, with the delivered water costing $106.76 per acre-foot. This compares with an estimated cost of $60.78 per acre-foot for a conventional irrigation system driven by natural gas at the current price (1980 dollars) of $2.72/mm Btu. It is obvious that if natural gas prices continue to rise, or if geothermal resources can be found at depths less than 2000 meters, then the geothermal irrigation pumping system would be attractive economically. The importance of water to the economy and growth of Arizona was summarized. Total water consumption in Arizona is about 7,600,000 acre-feet annually of which about 87% is used for agriculture. DOE

N83-21642# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
OPTIMIZATION OF SOLAR-SELECTIVE PAINT COATINGS Final Report, 15 Sep. 1980 - 15 Jun. 1982
M. A. McChesney, Paul B. Zimmer, and R. J. H. Lin Jun. 1982 69 p refs
(Contract DE-AC04-78CS-14287)
(DE83-001278; DOE/CS-14287/T2) Avail: NTIS HC A04/MF A01

The objective was the development of low-cost, high-performance, solar-selective paint coatings for solar flat-plate collector (FPC) use and passive thermal wall application. Thickness-sensitive selective paint coating development was intended to demonstrate large scale producibility. Thickness-insensitive selective paint (TISP) coating development was intended to develop and optimize the coating for passive solar systems and FPC applications. Low-cost, high-performance TSSP coatings and processes were developed to demonstrate large-scale producibility and meet all program goals. Dip, spray, roll, laminating and gravure processes were investigated and used to produce final samples. High-speed gravure coating was selected as the most promising process for solar foil fabrication. Development and optimization of TISP coatings was not completely successful. A variation in reflective metal pigment was suspected of being the primary problem, although other variables may have contributed. Consistent repeating of optical properties of these coatings achieved on the previous program was not achieved. DOE

N83-21643# Brookhaven National Lab., Upton, N. Y. Solar and Renewables Div.
DEVELOPMENT OF POLYMER FILM SOLAR COLLECTORS: A STATUS REPORT
W. G. Wilhelm and J. W. Andrews Aug. 1982 29 p refs
(Contract DE-AC02-76CH-00016)
(DE83-005995; BNL-51582) Avail: NTIS HC A03/MF A01

Solar energy collector panels using polymer film and laminate technology were developed which demonstrate low cost and high thermal performance for residential and commercial applications.

This device uses common water in the absorber/heat exchanger which is constructed with polymer film adhesively laminated to aluminum foil as the outer surfaces. Stressed polymer films are also used for the outer window and back surface of the panel forming a high strength structural composite. Rigid polymer foam complements the design by contributing insulation and structural definition. This design resulted in very low weight (3.5 kg/m(2)), potentially very low manufacturing cost (aprox. $11/m(2)), and high thermal performance. The development of polymer materials for this technology will be a key to early commercial success. DOE

N83-21776# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF PROCESS OF DECOMPOSITION OF WHEAT STRAW UNDER ARTIFICIAL CONDITIONS
Ye. A. Deshevaya, I. V. Kryuchkova, Yu. I. Shaydorov, and V. V. Popov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 108-113 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 75-79 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N83-21644# Central Electricity Generating Board, London (England).
EFFECTS OF PLATE SPACING ON THE EFFICIENCY OF AN ELECTROSTATIC PRECIPITATOR
Ekkehard Weber 27 Oct. 1982 15 p refs Transl. into ENGLISH from Staub (West Germany), v. 40, no. 11, Nov. 1980 p 469-473 (BLL-CE-Trans-7791-(9022.090)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The effect of plate spacing on the efficiency of an electrostatic precipitator was investigated. For that purpose, laboratory experiments were performed on a test precipitator with variable plate spacing of up to 715 mm. A proportionality was found between the migration velocity and the plate spacing. Apart from the current/voltage characteristics, also the rise in migration velocity with increasing gas velocity was determined. A laser device was used to measure dust concentration profiles which indicate an approximately linear increase from the centre of the duct towards the precipitation electrode. Optimization of electrostatic precipitators by enlarging the plate spacing appears to be possible. Author

N83-21645# Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau, Munich (West Germany).
HYGIENIZING OF SEWAGE SLUDGE BY GAMMA RADIATION AND HEAT TREATMENT: EFFECT OF HYGIENIZED SEWAGE SLUDGE ON SOIL AND PLANTS Final Report, Dec. 1980
Adalbert Suess, Gerhard Schurmann, Theodor Beck, Anton Rosopulo, and Albert Haisch Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-218; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,10

A final report is presented about hygienizing sewage sludge. At present agriculture is an important link in the recycling process of sewage sludge from domestic waste water. However, its use is limited by the content of pathogenes. Therefore the effect of gamma-irradiated as well as of pasturized sewage sludge on the growth of plants was investigated. For that reason, the quality of irridatiated, pasteurized and untreated sewage sludge for plant production was analysed by field and vegetation container experiments during a three years program. In the field experiments the value of the non treated and irradiated sewage sludge for plant production proved to be equal. Heat-treated sewage sludge came off worse presumably due to an unfavourable side effect on the soil microflora. The application of irradiated sewage sludge in the plant production is recommended. Author (ESA)

N83-21646# Landratsamt Schwaebisch Hall (West Germany).
SANITARY LANDFILL AT SCHWAEBISCH HALL: HOMOGENIZATION AND ROTTING OF THE REFUSE BEFORE EMPLACEMENT Final Report, May 1981
Bernd Jourdan, Peter Spillmann, Helga Muenz, Esther Britzius, Juergen Stritzke, Herbert Koch, Gottfried Holch, and Albert Rothmund Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 255 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-180; ISSN-0340-7608) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Karlsruhe, West German DM 42

The construction and operation of the Hasenbuhl aerobic landfill research project is described. The work concentrated on leachate and gas emissions; health effects, hygiene and the proof for a sufficient oxygen supply for a trouble free aerobic landfill considered. Facts concerning the reduction of emissions from the aerobic landfill before the highly compacted emplacement which these on an extension of the operating life by increasin the bulk weight is examined. The advantages of gas, leachate and bulk weight are shown and it is found that an aerobic landfill can be operated economically. E.A.K.

N83-21647# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
MIE CALCULATIONS ON PARTICLE SIZE DISTRIBUTIONS. INFLUENCE OF SIZE LIMITS AND COMPLEX REFRACTIVE INDICES ON THE CALCULATED EXTINCTION AND BACKSCATTER COEFFICIENTS
G. deLeeuw Sep. 1982 81 p refs
(Contract A78/KL/121)
(PHL-1982-50; TDCK-77127) Avail: NTIS HC A05/MF A01

Extinction and backscatter were calculated at four wavelengths from three particle size distribution obtained by averaging distributions measured at visibilities of 1 to 2 km, 5 to 10 km and greater than 10 km. In order to investigate the effect of the real and the imaginary part of the refractive index, the computations were performed for 47 refractive indices. This includes a wide range of values which were reported for the atmospheric aerosol and its constituents in order to determine the influence of extrapolation of the size distributions beyond the range usually measured, and the influence of confining the distribution to a limited range the calculations were performed for 15 size intervals. Strong dependencies are observed of the backscatter on both the real and imaginary part of the refractive index. The influence of these parameters on the extinction is much smaller. From these observations a method was inferred to determine in situ the effective complex refractive index of the ambient aerosol by simultaneous measurements of LIDAR signals and particle size distributions. The assumption of a constant signal scattering albedo in the evaluation of LIDAR signals in an inhomogeneous atmosphere by Klett's method is discussed. M.G.

N83-21648# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
NORTH SEA PROJECT 2: AEROSOL MEASUREMENTS ONBOARD A SHIP, AT A SEA DYKE AND IN AN AIRCRAFT
G. deLeeuw and A. Plomp Oct. 1982 50 p refs
(Contract NATO-AC/243; A79/KM/075)
(PHL-1982-51; ECN-82-113) Avail: NTIS HC A03/MF A01

Particle size distributions of atmospheric aerosols measured at the North Sea from a ship are compared with distributions sampled simultaneously on a seadyke near Petten (the Netherlands) from August 31st till September 3rd 1981 and with distributions measured from an aircraft on September 4th 1981 near the island Texel. Higher concentrations of large particles measured on the ship are ascribed to the lower elevation of the probes at the ship and to removal of large maritime aerosol particles

above the continent. The difference in measuring equipment may also have been of influence. Production of maritime aerosols was small due to low wind speeds. Attenuation of electromagnetic radiation by atmospheric aerosols is calculated by Mie theory.
Author

N83-21649# Committee on Foreign Affairs (U. S. House).
REVIEW OF THE GLOBAL ENVIRONMENT 10 YEARS AFTER STOCKHOLM
Washington GPO 1982 534 p Hearings before the Subcomm. on Human Rights and Intern. Organ. of the Comm. on Foreign Affairs, 97th Congr., 2d Sess., 30 Mar., 1 and 20 Apr., 1982
(GPO-97-152) Avail: Subcomm. on Human Rights and International Organizations

International Environmental Policy has three major areas of focus: establish a scorecard of the major accomplishments and failures since Stockholm; assess where we stand today in relation to global environmental problems; and explore the global environmental agenda for the 1980's. B.G.

N83-21650# Virginia Polytechnic Inst. and State Univ., Blacksburg. Virginia Center for Coal and Energy Research.
ACID PRECIPITATION: A CRITIQUE OF PRESENT KNOWLEDGE AND PROPOSED ACTION
Walter R. Hibbard, Jr. 1 Jun. 1982 34 p refs
(DE83-900303; VPI/CER-3900303) Avail: NTIS HC A03/MF A01

This study surveys the evidence, describes the situation, and proposes recommendations to reduce acid precipitation in a cost effective way. Acid precipitation is damaging to the ecology and is present in many areas. Possible sources of acid precipitation are identified, but their specific role and effects have not yet been resolved in an unambiguous manner. Research is needed to determine the mechanism of acid transformation, transport and disposition so that the role of various sources can be evaluated and the most cost effective counter measures chosen. The effects of actual acid precipitation on forests, vegetation, fish, lakes and ecology are real, but not as bad as originally thought nor does the acidification seem to be changing very quickly. Current legislation, focused on sulfur dioxide emissions from coal burning utilities, will cost $2 to $6 billion per year and will be paid for primarily by utility customers in 10 states. The benefits of this legislation are not at all certain. Sulfur dioxide reduction in Japan did not control acid precipitation, for example. It is highly probable that local sources are a significant cause of acid precipitation, and these sources are not addressed by the legislation. DOE

N83-21651# UOP, Inc., McLean, Va.
PRELIMINARY EVALUATION OF ENVIRONMENTAL ISSUES ON THE USE OF PEAT AS AN ENERGY SOURCE
R. King, S. Richardson, A. Walters, L. Boesch, W. Thomson, and J. Irons 14 Mar. 1980 304 p refs Prepared in cooperation with SDC/Integrated Services, Inc.
(Contracts DE-AC01-78ET-10159; ET-78-C-01-3117)
(DE83-000820; DOE/ET-10159/T21; TR-80/025-001) Avail: NTIS HC A14/MF A01

The environmental effects, that could arise from an extensive peat utilization program were studied. The objectives of this report are to: identify the environmental issues and potential problems; examine the significance of issues in the geographical regions where peat use could be developed; and establish a methodology by which issues can be resolved or clarified through future coordinated private, state, and federal programs. An overview of peat development of conversion technologies, extraction and harvesting procedures, and land reclamation is presented. Environmental concerning water resouces and quality, air quality, health and safety issues, solid waste management, and land reclamation are discussed. The general environmental issues, resources availability, and attitudes toward potential peat development in 10 states, containing an estimated 90% of US peat resources were were described. The 10 states reviewed are Alaska, Minnesota, Michigan, Maine, North and South Carolina, Wisconsin, New York, Florida, and Louisiana. DOE

N83-21652# Brookhaven National Lab., Upton, N. Y.
PROLEGOMENA TO STUDIES OF GAS-AQUEOUS REACTIONS IN CLOUDS
S. E. Schwartz Feb. 1982 5 p refs Presented at 2nd Symp. on the Composition of the Nonurban Troposphere, Williamsburg, Va., 25 May 1982
(Contract DE-AC02-76CH-00016)
(DE82-009881; BNL-30982; CONF-820529-2) Avail: NTIS HC A02/MF A01

The incorporation of gaseous materials by cloud liquid water was widely invoked as a significant process in removal of these substances from the atmosphere and in acidification of precipitation. Such a process in general involves mass transport in the gas and aqueous phases, physical dissolution of the reactive gas, and chemical reaction. Some general concepts pertinent to the rate and extent of such reactions are reviewed. Consideration of these concepts is useful in evaluating rates of in-cloud reactions and in the design and interpretation of field measurements. DOE

N83-21653# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
CARBON DIOXIDE EFFECTS RESEARCH AND ASSESSMENT PROGRAM. ENVIRONMENTAL AND SOCIETAL CONSEQUENCES OF A POSSIBLE CO2-INDUCED CLIMATE CHANGE. VOLUME 2, PART 3: INFLUENCE OF SHORT-TERM CLIMATE FLUCTUATIONS ON PERMAFROST TERRAIN
Jerry Brown and John T. Andrews (Colorado Univ., Boulder) May 1982 33 p refs 2 Vol.
(Contract DE-AS01-79EV-10019)
(DE82-017379; DOE/EV-10019/02-Vol-2-Pt-3) Avail: NTIS HC A03/MF A01

This report discusses how climatic analyses, permafrost temperatures, and geomorphic processes might be used to interpret the influence of a CO2 induced climate change on northern ecosystems. It is based on a series of informal discussions amongst the authors and several specialists conducted over a period of several months in spring 1980, at the request of the Department of Energy - American Association for the Advancement of Science CO2 Project. The report concludes with a generalized research outline for documenting the cause and effect relationships discussed. DOE

N83-21654# Mound Lab., Miamisburg, Ohio.
ENVIRONMENTAL MONITORING Annual Report, 1981
B. M. Farmer and D. G. Carfagno 21 Apr. 1982 50 p refs
(Contract DE-AC04-76DP-00053)
(DE82-013231; MLM-2930) Avail: NTIS HC A03/MF A01

The environment locally surrounding Mound was monitored primarily for tritium and plutonium-238. The results are reported for 1981. The environmental medium analyzed included air, water, vegetation, foodstuffs and sediment. The average concentrations of plutonium-238 and tritium were within the applicable standards (adopted by the US DOE) for radioactive species. DOE

N83-21655# Los Alamos Scientific Lab., N. Mex.
APPLICATION AND DEVELOPMENT OF THE FOUR CORNERS AIR-DISPERSION MODES
Michael D. Williams, Carolyn A. Mangeng, Sumner Barr, and Renate Lewis 1982 19 p refs Presented at the 75th Ann. Meeting on the Air Pollution Control Assoc., New Orleans, 20-25 Jun. 1982
(Contract W-7405-eng-36)
(DE82-014078; LA-UR-82-1007; CONF-820627-4) Avail: NTIS HC A02/MF A01

A model was developed to provide reasonable estimates of short-term concentrations in an area characterized by complex terrain and sparse meteorological data. The model has a number of strong points including the inclusion of drainage winds and partial penetration of elevated inversion layers and the ability to distinguish between rough and moderately rough terrain. In addition, the model is driven by a comprehensive, consistent meteorological data base. Finally, the model appears to give very good agreement with measurements on high terrain. The model's weaknesses include limited testing of the validity of parameters in very rough

terrain at distances beyond 15 km or at distances beyond 50 km in moderately rough terrain. Furthermore, the model does not treat deposition, steering by terrain, or travel-time effects. Application of the model to the Four Corners area with high growth in 1995 indicates that a very large amount of development is consistent with the 1977 CAA. DOE

N83-21656# Oak Ridge National Lab., Tenn. Health and Safety Research Div.

QUANTIFICATION OF SURFACE CONTAMINATION: PRINCIPLES AND APPLICATIONS

T. Vo-Dinh 1982 18 p refs Presented at the Inst. of Environ. Sci. Conf., Atlanta, 20 Apr. 1982

(Contract W-7405-eng-26)

(DE82-013542; CONF-820411-6) Avail: NTIS HC A02/MF A01

The applications discussed in this paper underscore the usefulness and versatility of molecular luminescence spectroscopy as an efficient surface detection technique. The technique can be used not only as a qualitative characterization method, but also as a quantitative analytical tool to detect trace contaminants of surfaces. Recent advances in instrumentation and methodology have expanded the applicability of surface luminescence into many new problem areas. Trace organics are emphasized here. DOE

N83-21657# Fermi National Accelerator Lab., Batavia, Ill.

ENVIRONMENTAL MONITORING

Samuel I. Baker 1 May 1982 93 p refs

(Contract DE-AC02-76CH-03000)

(DE82-014429; FERMILAB-82/22) Avail: NTIS HC A05/MF A01

The accelerator operated routinely at 400 GeV during CY-1981 with about the same number of protons accelerated during CY-1981 as in CY-1980. The total number of protons accelerated in 1981 was 1.4 X 10 to the 19th power. Typical operation was at about 45 percent of the design intensity of 5 X 10 to the 13th power protons per acceleration cycle. During CY-1981 there were no abnormal occurrences which had an impact on the facility and its operation. Copper sulfate was used this year to control algae and weed growth in ditches and is suspected of causing the death of three birds. The maximum potential radiation exposure at the site boundary during CY-1981 (fence line assuming 24 hr/day occupancy) was 1.8 mrem compared to 0.3 mrem last year. The total potential radiation exposure to the general off-site population from Fermilab operations during CY-1981 was 11 person-rem compared to 1 person-rem last year. The increase in potential exposure occurred as a result of the off-site neutron dose this year. All exposure was from external radiation. Airborne radioactivity was released across the site boundary in small amounts throughout the year from the stack ventilating a Neutrino Area. DOE

N83-21658# General Research Corp., McLean, Va.

FEASIBILITY STUDY TO UTILIZE LIMING AS A TECHNIQUE TO MITIGATE SURFACE WATER ACIDIFICATION Interim Report

J. Fraser, D. Hinckley, R. Burt, and R. R. Severn Apr. 1982 112 p refs

(EPRI Proj. 1109-14)

(DE82-903668; EPRI-EA-2362) Avail: NTIS HC A06/MF A01

The feasibility of liming as a technique for mitigating surface water acidification is evaluated. The application of calcium-based alkaline materials to lakes and waterways is discussed. The types and combinations of alkaline materials, the input location, delivery modes, and approximate cost of some of the techniques are discussed. An assessment of potential chemical, physical and biological changes resulting from short- or long-term lime applications was made. Finally, recommendations were suggested for additional research needed to evaluate liming as a technique for mitigating the effects from surface water acidification. DOE

N83-21659# Cottrell Environmental Science, Somerville, N.J.

THE REMOVAL OF SO2 AND NOx FROM FLUE GAS BY MEANS OF A SPRAY DRYER/ELECTRON BEAM COMBINATION. A FEASIBILITY STUDY

D. J. Helfritch, P. L. Feldman, A. B. Ray, J. R. Morgan (High Voltage Engineering Corp.), and G. A. Hildreth (High Voltage Engineering Corp.) Apr. 1982 84 p refs

(Contract DE-FC01-81FE-15079)

(DE82-014500; DOE/FE-14079/T1) Avail: NTIS HC A05/MF A01

The feasibility of adding an electron beam between the spray dryer and the fabric filter of dry scrubber flue gas desulfurization (FGD) was examined. The beam promises effective removal of nitrogen oxides (NO/sub x/) and sulfur dioxide (SO2), even at higher coal-sulfur levels than usually economic for dry scrubbers. Feasibility and waste disposal were tested. The relatively low temperatures and high humidity downstream of the spray dryer favor economic beam operation. The beam removes SO2, so the dryer can be run for economy, not high removal. Safe landfilling of the nitrate-rich waste appears practical, with leachate carrying no more nitrate than natural rain and dustfall. We expect natural pozzolanic reactions between alumina-silica compounds in the fly ash and lime compounds from the spray dryer to form an impermeable concrete like material within 10 days after landfilling. DOE

N83-21660# Dames and Moore, Bethesda, Md.

UNDERGROUND ELECTRIC POWER TRANSMISSION SYSTEM ENVIRONMENTAL IMPACT ASSESSMENT

Feb. 1982 229 p refs

(Contract DE-AC01-78ET-29163)

(DE82-011037; DOE/ET-29163/T1) Avail: NTIS HC A11/MF A01

The US Department of Energy, Division of Electric Energy Systems, has undertaken to identify the environmental issues and potential impacts associated with the installation of underground electric power transmission systems. This study reports the results of investigations into the advanced cable technologies being considered for future underground applications, as part of the development oriented research program of the Division of Electric Energy Systems. While the technology involves a high level of sophistication, there are relatively few impacts to the environment that are potentially significant, and of these none are inherently non-mitigable. Route planning, system design, and methods of construction and accident response can be pursued in order to minimize impacts where strict constraints are appropriate. DOE

N83-21661# Sandia Labs., Albuquerque, N. Mex.

VERTICAL SAMPLING FLIGHTS IN SUPPORT OF THE 1981 ASCOT COOLING TOWER EXPERIMENTS: FIELD EFFORT AND DATA

G. T. Gay Mar. 1982 49 p refs

(Contract DE-AC04-76DP-00789)

(DE82-014269; SAND-82-0172) Avail: NTIS HC A03/MF A01

During the month of August 1981, three nights of experimental sampling of tracers released into the cooling tower plume of a geothermal power plant were conducted. In these experiments a tethered balloon was used to lift a payload so as to obtain vertical profiles of the cooling tower plume and the entrained tracers. A description of the equipment used, the field effort and the data acquired are presented here. DOE

N83-21662# Oak Ridge National Lab., Tenn. Computer Sciences Div.

AGTEHM: DOCUMENTATION OF MODIFICATIONS TO THE TERRESTRIAL ECOSYSTEM HYDROLOGY MODEL (TEHM) FOR AGRICULTURAL APPLICATIONS

D. M. Hetrick, J. T. Holdeman, and R. J. Luxmoore May 1982 124 p refs

(Contract W-7405-eng-26)

(DE82-015857; ORNL/TM-7856; Publ-1770) Avail: NTIS HC A06/MF A01

The AGTEHM, an agricultural application version of (TEHM), the terrestrial ecosystem hydrology model is a model to finance the complex interrelations of air, water, land, and vegetation. The TEHM combines mechanical algorithms for climatic and hydrologic processes with vegetation properties to explicitly simulate interception, throughfall, infiltration, root zone evaporation, transpiration,

drainage, plant and soil water potential, unsaturated and saturated subsurface flow, surface runoff, and open channel flow. The AGTEHM was developed from TEHM and several innovations are added for agricultural applications. These include changes in the input data options, algorithms for sprinkler and flood irrigation, and alternative surface resistance-water potential relationship, a variable-contributing-area function, and the coupling of a model for soil macropore effects on water flow. DOE

N83-21663# Oak Ridge National Lab., Tenn. Industrial Safety and Applied Health Physics Div.

COMPUTERIZED MANAGEMENT OF NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) DATA AT OAK RIDGE NATIONAL LABORATORY

D. P. Carnes and S. R. blum (Union Carbide Corp.) 1982 11 p refs Presented at the UCC-ND and GAT Environ. Protection Seminar, Gatlinburg, Tenn., 5 Apr. 1982

(Contract W-7405-eng-26)

(DE82-013440; CONF-820418-15) Avail: NTIS HC A02/MF A01

A program for computerized handling of information on quality of waste-water discharges at three Oak Ridge National Laboratory monitoring stations was designed and implemented. This computer system analyses field and laboratory data and calculates water quality statistics appropriate for meeting national pollutant discharge elimination system (NPDES) reporting requirements. The interactive nature of the program guarantees automatic identification of compliance violations for immediate notification of the responsible agencies. Reduction of manual processing has resulted in cost savings and greater reporting accuracy. DOE

N83-21664# General Electric Co., St. Petersburg, Fla. Chemistry Lab.

AMMONIA DETERMINATION IN AIR SAMPLES

J. C. Foster 10 Dec. 1982 10 p ref

(Contract DE-AC04-76DP-00656)

(DE83-004407; GEPP-TIS-684) Avail: NTIS HC A02/MF A01

A modification of the airborne ammonia detection method recommended by the National Institute for Occupational Safety and Health is described. The method measures the average ammonia exposure near an employee's breathing zone. By plotting a calibration curve from the electrode slope and response check potentials, a standard addition was not necessary for calibration. The desorption efficiency was found to be 89%. DOE

N83-21665# Los Alamos Scientific Lab., N. Mex.

A STUDY OF THE POTENTIAL HEALTH AND ENVIRONMENTAL IMPACTS FROM THE DEVELOPMENT OF LIQUID-DOMINATED GEOTHERMAL RESOURCES

Joel M. Williams, ed. Sep. 1982 57 p refs

(Contract W-7405-eng-36)

(DE83-004470; LA-9407-P) Avail: NTIS HC A04/MF A01

Seven programs to provide scientific input, understanding, and forecasting capability for hydrothermal energy areas needing resolution are described. The three major areas addressed are: (1) the impacts on living components of the aqueous and terrestrial ecosystems; (2) the impacts on the quality of the abiotic environment itself; and (3) the techniques needed to measure releases from hydrothermal activities. DOE

N83-21666# Texas Univ., Austin. Center for Energy Studies.

FUTURE LANDSCAPES OF THE COLORADO PLATEAU: IMPACTS OF ENERGY DEVELOPMENT

William E. deBuys, Jr. and Robin W. Doughty Jul. 1982 127 p refs

(DE83-900473; UT/CES-PS-19) Avail: NTIS HC A07/MF A01

The transformations taking place on the Colorado Plateau in the areas of mine reclamation, wildlife protection, surface and groundwater allocation, air quality management, and boomtown growth are discussed. These subjects are treated in a unified fashion as constituent elements of a single entity called the cultural landscape. That term refers not only to the geophysical realities of topography, vegetation, and animal life, but also to the cultural realities of man's impact on environment and on himself. By taking this holistic approach, an attempt is made to render a more complete and balanced portrait of the region's future than one usually finds in the literature of impact assessment. DOE

N83-21667# Environmental Monitoring and Support Lab., Research Triangle Park, N. C.

SECTION C: COMMUNITY AIR SAMPLING

David O. Hinton 1982 16 p refs

(PB83-118802; EPA-600/D-82-337) Avail: NTIS HC A02/MF A01 CSCL 13B

Community air sampling ranges from simple infrequent measurement of individual pollutants to complex, continuous monitoring of multiple pollutants. To aid in planning a sampling program, suggestions are given with respect to purpose, site, location, sampling frequency, methods, Quality Assurance, and data retrieval. To aid in site selection and/or estimate historical air pollution levels, estimating techniques and their limitations are discussed. Limitations on the use/usefulness of fixed location, outside air monitoring stations are discussed. The need for instrumentation to provide levels of individual ambient exposure is also discussed. GRA

N83-21668# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Marine Pollution Assessment.

OFFICE OF MARINE POLLUTION ASSESSMENT NORTHEAST OFFICE REPORT FOR FISCAL YEARS 1979 - 1980 Summary Report

Boulder, Colo. Jul. 1982 43 p refs

(PB83-118083; NOAA-82090205) Avail: NTIS HC A03/MF A01 CSCL 08J

This Summary Report for FY1979 and FY1980 presents important accomplishments of the MESA New York Bight Project (NYBP) during those years and the Hudson-Raritan Estuary Project (HREP) during FY1980. The NYBP is a comprehensive, multidisciplinary, regional study addressing the problems of a large body of water. The two goals to the NYBP are: to determine the types, transport rates, fates, and impacts of pollutants and other human-related activities on this ecosystem; and to describe the major existing ecological systems, processes, natural stresses, and responses operating in the Bight, as well as their relationships and rates of change. GRA

N83-21669# General Accounting Office, Washington, D. C. Community and Economic Development Div.

PROBLEMS IN AIR QUALITY MONITORING SYSTEM AFFECT DATA RELIABILITY

22 Sep. 1982 55 p refs

(PB83-112995; GAO/CED-82-101; B-206212) Avail: NTIS HC A04/MF A01 CSCL 13B

The Environmental Protection Agency (EPA), which is responsible for directing the Nation's effort to improve air quality, makes numerous decisions affecting the Nation's health and economic welfare. EPA has established a national air quality monitoring system to collect the data used as a basis for these decisions. Problems in this monitoring system raise questions about the reliability of air quality data. EPA actions to resolve these problems have been slow and costly. In this report GAO recommends several actions EPA and the Congress can take to correct the situation. Author (GRA)

N83-21670# Environmental Protection Agency, Research Triangle Park, N.C.

NATIONAL AIR POLLUTANT EMISSION ESTIMATES, 1970 - 1981 Final Report

Sep. 1982 44 p refs

(PB83-115600; EPA-450/4-82-012) Avail: NTIS HC A03/MF A01 CSCL 13B

This report presents estimates of trends in nationwide air pollutant emissions for the five major pollutants: sulfur oxides, particulates, carbon monoxide, volatile organic compounds, and nitrogen oxides. Estimates are broken down according to major types of air pollutant sources. A short analysis of emission trends

is given, along with a discussion of methods used to develop the data. Author (GRA)

N83-21671# North Carolina State Univ., Raleigh. Sea Grant Coll. Program.
BUILDING AND STABILIZING COASTAL DUNES WITH VEGETATION
S. W. Broome, E. D. Seneca, W. W. Woodhouse, Jr., and Cassie Griffin Jun. 1982 24 p refs
(Contract NA81AA-D-00026)
(PB83-117093; UNC-SG-82-05; NOAA-82091602) Avail: NTIS HC A02/MF A01 CSCL 13B

Barrier dunes are natural features that occur on seashores wherever there is a sand supply and wind to transport it. Sand is brought to the beach by wave action where it is blown landward by onshore winds. When an obstacle such as driftwood, a sand fence or vegetation is encountered, the wind velocity is reduced and sand begins to accumulate. Plants adapted to the dune environment grow up through the sand as it accumulates, stabilizing the surfaces and promoting further accretion. Dunes act as temporary protective barriers during storm tides of short duration, but they should not be considered permanent structures that can be expected to 'hold off the ocean.' Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N83-21672# Ruhrkohle A.G., Essen (West Germany).
THREE-DIMENSIONAL SEISMICS WITH HIGH RESOLUTION TO IMAGE MEDIUM SCALE TECTONICS AT THE BOUNDARY OVERBURDEN-CARBONIFEROUS Final Report, Apr. 1980
Reiner-Werner Heil, Horst Rueter, Leo Ameely, Klaus Luetzenkirchen, Dietrich Ristow, Wolfgang Houba, and Erich Meixner Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 224 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-013; ISSN-0340-7608) Avail: NTIS HC A10/MF A01

A new type of 3D seismology was developed to improve the vertical and horizontal resolution of the seismic image. This allows to resolve medium scale tectonic elements at the boundary overburden carboniferous, which are very important for the coal mining. Proper parameters for shots and geophone groups and for the areal arrangement were developed. New processing techniques, including 3D-residual-statics and 3D-migration further improve the image of the subsurface. To interpret the enormous amount of information an interactive interpretation system was developed including hardware and software. E.A.K.

N83-21673# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Groupe 1: Physics.
VERTICAL ATMOSPHERIC PROFILES: MEASUREMENTS BY LIDAR
G. J. Kunz Sep. 1982 25 p refs
(Contract A78/KL/121)
(PHL-1982-49; TDCK-77031) Avail: NTIS HC A02/MF A01

A method to determine the vertical atmospheric extinction and backscatter coefficients in a quantitative way by a monostatic lidar system is presented. It was possible to invert the lidar equation by using a boundary condition at low altitude. This low altitude boundary condition is measured accurately and a potential verification is pointed out. The theory is summarized and some practical examples are compared with data obtained by the Klett method. The results are important in the application of slant path operations of optical sensors. E.A.K.

N83-21674*# Lunar and Planetary Inst., Houston, Tex.
CONCEPT FOR A RESEARCH PROJECT IN EARLY CRUSTAL GENESIS
Roger J. Phillips, comp. and Lewis Ashwal, comp. 1 Apr. 1983 42 p refs
(Contract NASw-3389)
(NASA-CR-170106; NAS 1.26:170106; LPI-TR-81-08) Avail: NTIS HC A03/MF A01 CSCL 08G

Planetary volatiles, physical and chemical planetary evolution, surface processes, planetary formation, metallogenesis, crustal features and their development, tectonics, and paleobiology are discussed. N.W.

N83-21675*# Lunar and Planetary Inst., Houston, Tex.
WORKSHOP ON MAGMATIC PROCESSES OF EARLY PLANETARY CRUSTS: MAGMA OCEANS AND STRATIFORM LAYERED INTRUSIONS
D. Walker, ed. and I. S. McCallum, ed. 1981 249 p refs Workshop held at Houston, Tex., 3-6 Aug. 1981
(Contract NASw-3389)
(NASA-CR-170108; NAS 1.26:170108; LPI-TR-82-01) Avail: NTIS HC A11/MF A01 CSCL 08G

The significance of the lunar highland pristine cumulate samples were reevaluated with the aid of the additional insights provided by geologically constrained terrestrial investigations. This exercise involved a review of the state of knowledge about terrestrial and lunar cumulate rocks as well as an enumeration and reevaluation of the processes hypothesized to have been responsible for their formation, both classically and at present. S.L.

N83-21676*# Research Inst. of Colorado, Fort Collins.
RADIATION BUDGET MEASUREMENT/MODEL INTERFACE Final Technical Report, Feb. 1981 - Nov. 1982
Thomas H. VonderHaar, Paul Ciesielski, David Randel, and Duane Stevens Mar. 1983 52 p refs
(Grant NAG1-150)
(NASA-CR-170125; NAS 1.26:170125) Avail: NTIS HC A04/MF A01 CSCL 04A

This final report includes research results from the period February, 1981 through November, 1982. Two new results combine to form the final portion of this work. They are the work by Hanna (1982) and Stevens to successfully test and demonstrate a low-order spectral climate model and the work by Ciesielski et al. (1983) to combine and test the new radiation budget results from NIMBUS-7 with earlier satellite measurements. Together, the two related activities set the stage for future research on radiation budget measurement/model interfacing. Such combination of results will lead to new applications of satellite data to climate problems. The objectives of this research under the present contract are therefore satisfied. Additional research reported herein includes the compilation and documentation of the radiation budget data set a Colorado State University and the definition of climate-related experiments suggested after lengthy analysis of the satellite radiation budget experiments. B.W.

N83-21677*# Science Applications, Inc., Dayton, Ohio.
ATMOSPHERIC RADIATION MODEL FOR WATER SURFACES Final Technical Report, 4 Mar. 1981 - 15 Jul. 1982
Robert E. Turner, Daniel W. Gaskill, and James R. Lierzer May 1982 67 p refs
(Contract NAS3-22495)
(NASA-CR-167873; NAS 1.26:167873; SAI-82-002-AA) Avail: NTIS HC A04/MF A01 CSCL 04A

An atmospheric correction model was extended to account for various atmospheric radiation components in remotely sensed data. Components such as the atmospheric path radiance which results from singly scattered sky radiation specularly reflected by the water surface are considered. A component which is referred to as the virtual Sun path radiance, i.e. the singly scattered path radiance which results from the solar radiation which is specularly reflected by the water surface is also considered. These atmospheric radiation components are coded into a computer program for the analysis of multispectral remote sensor data over the Great Lakes of the United States. The user must know certain parameters,

such as the visibility or spectral optical thickness of the atmosphere and the geometry of the sensor with respect to the Sun and the target elements under investigation. Author

N83-21678*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
MIRROR INSTABILITY AND ORIGIN OF MORNINGSIDE AURORAL STRUCTURE
Y. T. Chiu, M. Schulz, J. F. Fennell, and A. M. Kishi 1 Mar. 1983 72 p refs
(Contract NASw-3434)
(NASA-CR-170109; NAS 1.26:170109; ATR-81(7951)-3) Avail: NTIS HC A05/MF A01 CSCL 04A

Auroral optical imagery shows marked differences between auroral features of the evening and morning sectors: the separation between diffuse and discrete auroras in the evening sector is not distinct in the morning sector, which is dominated by auroral patches and multiple banded structures aligned along some direction. Plasma distribution function signatures also show marked differences: downward electron beams and inverted-V signatures prefer the evening sector, while the electron spectra on the morning sector are similar to the diffuse aurora. A theory of morningside auroras consistent with these features was constructed. The theory is based on modulation of the growth rates of electron cyclotron waves by the mirror instability, which is in turn driven by inward-convected ions that have become anisotropic. This modulation produces alternating bands of enhanced and reduced electron precipitation which approximate the observed multiple auroral bands and patches of the morning sector. B.W.

N83-21679*# Stanford Univ., Calif. Radioscience Lab.
A SELF-CONSISTENT COMPUTER CODE FOR PARTICLE SIMULATIONS Final Report, 1 Oct. 1980 - 30 Sep. 1981
Mar. 1983 21 p refs
(Grant NAG5-120)
(NASA-CR-170018; NAS 1.26:170018) Avail: NTIS HC A02/MF A01 CSCL 03B

A self-consistent computer code for particle simulations which could treat both Landau and cyclotron interactions is discussed. Author

N83-21680# Universite Catholique de Louvain (Belgium). Lab. de Telecommunications et d'Hyperfrequences.
INFLUENCE OF THE ATMOSPHERE ON THE PERFORMANCE OF SPACEBORNE IMAGING MICROWAVE RADIOMETERS (IMR 2). DISTANCE MEASUREMENTS CORRECTION. VOLUME 1: SUMMARY, CONCLUSIONS AND PROPOSALS Final Report
A. Guissard and M. deCoster Paris ESA Mar. 1982 95 p refs 2 Vol.
(Contract ESTEC-4702/81/NL-PP(SC))
(ESA-CR(P)-1643-Vol-1) Avail: NTIS HC A05/MF A01

The problem of correcting atmospheric range error from radiometric measurements is addressed. It forms part of preliminary work for ERS-1. One part of the payload will be a high-accuracy altimeter, one of whose missions will be to perform precise determinations of the geoid and of sea-surface irregularities less than 1 m in height. The altimeter should also be able to measure the surface wind speed with an accuracy of about 2 m/s. For such a mission, the position of the satellite must be known with similar accuracy. It must therefore be tracked continuously by a large set of ground based ranging instruments. In this study, corrections to both ground-based and space-based measurements are dealt with. Author

N83-21681# Universite Catholique de Louvain (Belgium). Lab. de Telecommunications et d'Hyperfrequences.
INFLUENCE OF THE ATMOSPHERE ON THE PERFORMANCE OF SPACEBORNE IMAGING MICROWAVE RADIOMETERS (IMR 2). DISTANCE MEASUREMENTS CORRECTION. VOLUME 2: COMPLEMENTS Final Report
A. Guissard and M. deCoster Paris ESA Mar. 1982 184 p refs 2 Vol.
(Contract ESTEC-4702/81/NL-PP(SC))
(ESA-CR(P)-1643-Vol-2) Avail: NTIS HC A09/MF A01

Range errors from the ionosphere and troposphere, radiometric measurement of atmospheric water vapor and liquid water, atmospheric attenuation, parameter estimation from noisy measurements, and performance analysis of radiometers are discussed. Author

N83-21682# European Space Agency, Paris (France).
HELIOMAGNETISM, GEOMAGNETISM, AND THE EARTH'S ATMOSPHERE
D. E. Page (ESTEC, Noordwijk, Neth.) Oct. 1982 35 p refs In ENGLISH; FRENCH summary
(ESA-STM-226; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

The quantity (an-as) positive minus (an-as) negative is found to vary through the year with the angular acceleration in Right Ascension of the Sun about the Earth. Smooth diurnal and seasonal dependence (an-as) displays catastrophic behavior reaching extreme values one day before magnetic storms. Going from quiet to disturbed magnetic conditions leads to storm recoveries which are faster in May and November (Sun accelerating in Right Ascension) but slower in February and August (Sun decelerating). A change of polarity of interplanetary magnetic field is shown to change the phase of the semidiurnal atmospheric pressure wave by around 15 minutes. When the Sun resets its magnetic grip on the Earth following interplanetary field reversals, the amount of torque change experienced by the Earth is proportional to the angular acceleration of the Sun about the Earth's spin axis. B.G.

N83-21683# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
THEORIES OF HIGH LATITUDE IONOSPHERIC IRREGULARITIES: A REVIEW Interim Report
M. J. Keskinen and S. L. Ossakow 17 Nov. 1982 44 p refs Presented at the URSI Symp. on Radio Probing of the High-Latitude Ionosphere and Atmosphere, Fairbanks, Alaska, Aug. 1982
(RR0330244)
(AD-A122385; NRL-MR-4949) Avail: NTIS HC A03/MF A01 CSCL 04/1

We present, in this paper, an overview of theories of naturally occurring high latitude E and F region ionospheric irregularities. (For a review of artificially-induced irregularities, e.g., from ionospheric 'heating' experiments, see Fejer 1979.) Emphasis is placed on recent results, particularly with regard to sources of high latitude irregularities. Physical mechanisms are stressed with extensive mathematical analysis avoided. Expertise in plasma physics has not been assumed. We summarize the recent and previous theoretical literature dealing with F region irregularities, and we concentrate on E region irregularity phenomena. GRA

N83-21684# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
ROBUST AUTHENTICATION FOR THE NATIONAL SEISMIC SYSTEM Final Report, 1 Jan. - 30 Nov. 1981
Joseph T. Beardwood Jan. 1982 68 p refs
(Contract MDA903-79-C-0202)
(AD-A122287; AD-E500552; IDA-P-1625; IDA/HQ-81-24010) Avail: NTIS HC A04/MF A01 CSCL 08/11

During recent (1977-1980) trilateral negotiations between the U.S., the USSR, and the U.K. leading toward a Comprehensive Nuclear Test Ban Treaty, it was agreed that in order to monitor compliance with the treaty when it entered into force, unmanned, tamperproof seismic observatories would be installed on the territories of the three parties. The seismic waveforms from each observatory are digitized and combined with other digital information concerning the status of the observatory. Each one second of the digital information is processed by a cryptologic algorithm whose output is appended to the data to permit authentication of the data (to prevent substitution or alteration), and the total digital signals transmitted, via satellite links, to the U.S., USSR, and U.K. for processing and analysis. Transmission errors with a prototype system resulted in an unacceptably high rate of authentication failures. Nine options were examined to lower the rate of authentica-

tion failures. These included various combinations of bandwidth reduction, redundant paths, forward error correction coding, and post-reception processing. Four of these options will result in a mean time between authentication failures substantially larger than the mean time between hardware failures. The cryptologic aspects of the authentication process are treated in a classified annex, published separately. GRA

N83-21685# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Programs Management Office.
GEOLOGY OF A STABLE INTRAPLATE REGION: THE CAPE VERDE/CANARY BASIN
J. Alan Ballard Mar. 1982 178 p refs
(AD-A122613; NORDA-45) Avail: NTIS HC A09/MF A01 CSCL 08/10

This report evaluates a unique bathymetric, magnetic, and seismic data set in terms of the geological history of a major ocean basin. It develops a seismic-siratigraphic classification for deep sea sediments and proposes a tectonic development history within the framework of sea floor spreading theory. The study will be useful to oceanographers, geologists, and geophysicists attempting to synthesize large quantities of data to construct a model for regional development. To resolve some of the controversies engendered by previous narrowly focused studies, this study will assess the relative importance of primary and secondary volcanism, epeirogenic uplift and subsidence, and determine the sequence of tectonic events that have modified Cape Verde/Canary Basin morphology since its formation and rifting away from the Mid-Atlantic Ridge. The geologic factors that must be considered in the solution to these problems include: (1) temporal and spatial distribution of fracture zones, small scale faults, abyssal hills and seamounts; (2) locations of depocenters, relationship between depocenters and post-rifting diastrophism, correlation of sediment distribution with island volcanism, seismic stratigraphic evidence for recent unwarping and the timing of such events; and the age of the sea floor, and the tectonic significances of the J anomaly, the M-sequence, and the Cretaceous magnetic Quiet Zone. GRA

N83-21686# Edaw, Inc., Palo Alto, Calif.
A COMPARISON OF ESTIMATED AND BACKGROUND SUBSIDENCE RATES IN TEXAS-LOUISIANA GEOPRESSURED GEOTHERMAL AREAS
L. M. Lee, M. Clayton, J. Everingham, R. C. Harding, and A. Massa Jun. 1982 148 p refs Prepared in cooperation with Earth Sciences Associates, Palo Alto, Calif.
(Contract DE-AC03-76SF-00098)
(DE83-004095; LBL-14681; GSRMP-13) Avail: NTIS HC A07/MF A01

A comparison of background and potential geopressured geothermal development-related subsidence rates is given. Estimated potential geopressured-related rates at six prospects are presented. The effect of subsidence on the Texas-Louisiana Gulf Coast is examined including the various associated ground movements and the possible effects of these ground movements on surficial processes. The relationships between ecosystems and subsidence, including the capability of geologic and biologic systems to adapt to subsidence, are analyzed. The actual potential for environmental impact caused by potential geopressured-related subsidence at each of four prospects is addressed. DOE

N83-21687# Sandia Labs., Albuquerque, N. Mex.
PORE STRUCTURE ANALYSIS OF SANDSTONES USING COMPUTER-PROCESSED PHOTOMICROGRAPHS
Leonard E. Duda and Janet K. Pitman (Geological Survey) Nov. 1982 43 p refs
(Contract DE-AC04-76DP-00789)
(DE83-004049; SAND-82-1083) Avail: NTIS HC A03/MF A01

A method was developed to digitize and quantify the pore networks of rocks using the apparent pore space observed in photographs of thin-sections. Statistical data are generated by digitizing numerous photographs, thereby making it possible to address the problem of pore structure. Pore structure is analyzed by specifying such parameters as the pore size and shape, anisotropy of the pore arrangement within the rock matrix, and pore connectivity. Quantitative information on pore size (perimeter area, surface to volume ratio, mean intercept length, and the largest pore dimension) is readily obtained. The use of at least two magnifications of thin-sections provides an accurate description of the pore size distribution. Pore shape, as determined by a shape parameter derived from the sterological data, is shown to correspond to a predominance of tabular rather than tubular pores. Several methods are outlined to determine the existence of anisotropy in the pore system. These methods showed no demonstrable anisotropy in the samples studied. DOE

N83-21688# Texas A&M Univ., College Station. Center for Tectonophysics.
MECHANICAL AND TRANSPORT PROPERTIES OF ROCKS AT HIGH TEMPERATURES AND PRESSURES. TASK 3. MECHANICAL PROPERTIES OF ROCKS AT HIGH TEMPERATURES AND PRESSURES Technical Progress Report, 1 Mar. - 30 Oct. 1982
M. Friedman, J. Handin, and S. J. Bauer Nov. 1982 116 p refs (Contract DE-AS05-79ER-10361; RF Proj. 4022C-03)
(DE83-003578; DOE/ER-10361/1-1; TR-3) Avail: NTIS HC A06/MF A01

In an effort to characterize the rheology and flow processes (mechanisms of deformation) operative for presupposed semi-brittle behavioral conditions, a series of drained constant stress creep tests was conducted on 2 x 4 cm specimens of dry and water-saturated (Pp = 100 MPa) Westerly Granite at 100 MPa effective confining pressure and temperatures of 3000C to in excess of Tm (10000C). The deformation is multimechanistic; microfracturing of apparent extensile and shear origin, glide in quartz and biotite, microfracture healing, dissolution, and mineral alteration are mechanisms observed and evaluated as functions of temperature and strain. The systematic change in micromechanisms observed with increasing temperature is compatible with and the origin of the gradational succession of macroscopic deformation modes from a single narrow fault (T/Tm less than or equal to .5) to a shear zone (T/Tm approx. = .6), to multiple shear fractures (T/Tm approx. = .75) to uniform flow (T/Tm greater than or equal to .9). Available equations of flow and time to failure are used as response models to characterize the experimental data even though the multimechanistic deformation described above and the quasi-steady state are not compatible with the assumptions underlying the corresponding theories. DOE

N83-21689# Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
MAGNETOTELLURIC RESPONSES OF THREE-DIMENSIONAL BODIES IN LAYERED EARTHS
Phillip E. Wannamaker, Stanley H. Ward, and Gerald W. Hohmann Nov. 1982 91 p refs
(Contract DE-AC07-79ID-12079)
(DE83-004060; DOE/ID-12079/87) Avail: NTIS HC A05/MF A01

In defining apparent resistivity and impedance phase for transverse magnetic (TM) modeling of 3-D bodies, a coordinate system derived using tipper-strike, calculated at the frequency for which tipper magnitude due to the structure of interest is large relative to that due to any nearby geological noise, is recommended. DOE

N83-21690# Oregon State Univ., Corvallis. School of Oceanography.
OPERATION OF A DIGITAL SEISMIC NETWORK ON MOUNT ST. HELENS VOLCANO AND OBSERVATIONS OF LONG-PERIOD SEISMIC EVENTS THAT ORIGINATE UNDER THE VOLCANO
Michael Fehler and Bernard Chouet (MIT) 1982 14 p refs
(Contracts DE-AT06-82ER-12017; EY-76-S-02-25430134)
(DE83-004901; DOE/ER-12017/5) Avail: NTIS HC A02/MF A01

A nine station digital seismic array was operated on the flanks of Mount St. Helens volcano in the state of Washington. The purpose was to obtain high quality digital seismic data from a

dense seismic array operating near and in the summit crater of the volcano to facilitate study of near field seismic waveforms generated under the volcano. Our goal is to investigate the source mechanism of volcanic tremor and seismic activity associated with magma intrusion, dome growth and steam-ash emissions occurring within the crater of Mount St. Helens. DOE

N83-21691# Oregon State Univ., Corvallis. School of Oceanography.
STUDIES OF DIGITAL SEISMIC DATA OBTAINED IN GEOTHERMAL AND VOLCANIC REGIONS Progress Report, 1 Feb. 1982 - 31 Jan. 1983
Michael Fehler 10 Aug. 1982 22 p refs
(Contract DE-AT06-82ER-12017)
(DE83-004898; DOE/ER-12017/1) Avail: NTIS HC A02/MF A01

Tremor waveforms and seismicity recorded at Mount St. Helens were studied. Seismicity accompanying hydrofracturing experiments carried out in the Jemez Mountains of New Mexico was monitored. Author

N83-21692# Lamont-Doherty Geological Observatory, Palisades, N. Y.
COMPREHENSIVE STUDY OF THE SEISMOTECTONICS OF THE EASTERN ALEUTIAN ARC AND ASSOCIATED VOLCANIC SYSTEMS Annual Progress Report, 1 Mar. 1982 - 28 Feb. 1983
K. H. Jacob, E. Hauksson, and L. R. Sykes 1 Nov. 1982 90 p refs
(Contract DE-AC02-76ER-03134)
(DE82-003010; DOE/ER-03134/44; COO-3134-44) Avail: NTIS HC A05/MF A01

The project is aimed to provide both a comprehensive overview of the seismicity, volcanicity, and tectonics of a major subduction zone, as well as a detailed in depth study of its microearthquake activity and crustal deformation. For the in depth study a digital seismic network of 14 seismic stations is operated. The Pavlof array monitors the seismicity associated with the magmatic processes in and beneath the most active volcano of the Aleutian arc. Uniform relocation of all hypocenters for 1973 to 1981 show a high concentration of seismicity near the 35 km deep down dip end of the main thrust zone, and in the overriding plate directly above the aseismic front. Teleseismic data, focal mechanisms, and tectonic evidence in the eastern and central Aleutians show a stress segmentation in the descending slab near the transition from a continental to an oceanic arc near 1650 W. Near 1730 W the Amlia fracture zone passes into the trench, tears the slab, and causes the formation of arc summit basins. Coexistence of thrust and normal faulting at depth of about 30 km beneath Kodiak and Kenai suggests strong bending moments in elastic structures of the subduction zone, structurally inherited anisotropy of fault strength, low apparent coefficients of friction for certain fault orientations, and high fluid pressures in these faults at and near the main thrust zone. DOE

N83-21693# Systems Science and Software, La Jolla, Calif.
INVERSION MODELING OF MULTIPLE GEOPHYSICAL DATA SETS FOR GEOTHERMAL EXPLORATION: APPLICATION TO ROOSEVELT HOT SPRINGS AREA Final Report
J. M. Savino, W. L. Rodi, and J. F. Masso Apr. 1982 119 p refs
(Contract DE-FC07-79ID-12067)
(DE83-003481; DOE/ID-12067/13; SSS-R-82-5516) Avail: NTIS HC A06/MF A01

The theoretical basis for modeling the arrival times of local earthquake P waves at a network of seismic stations is described. A technique for separating the dependence of network arrival times on velocity structure from the dependence on the earthquake location parameters is presented. Commented computer listings of the forward modeling algorithms developed in part under DOE support are given. The local arrival time and Bouguer gravity data sets acquired for the Roosevelt and Leach Hot Springs areas are described. The Leach data were found to be inadequate so the emphasis is on the editing and processing the Roosevelt Hot Springs data prior to inversion. The inversion model for the Roosevelt Hot Springs area obtained from a joint inversion of seismic and gravity data is described. The more robust features of the final model are discussed in light of the known geology and geophysics of the area and are compared to results obtained from related studies. DOE

N83-21694# Pacific Northwest Lab., Richland, Wash.
GEOTECHNICAL PROPERTIES OF PARAHO SPENT SHALE
T. E. Gates Oct. 1982 47 p refs
(Contract DE-AC06-76RL-01830)
(DE83-002633; PNL-4357) Avail: NTIS HC A03/MF A01

A literature review of available geotechnical properties for PARAHO retorted shale was conducted. Also reported are laboratory measurements made at PNL on key hydraulic properties of the PARAHO retorted shale. The PARAHO material can be compacted in the laboratory to dry densities of 12.1 KN/cu m. (77.0 pcf) to 17.0 Kn/cu m (108.4 pcf) depending on compaction effort. Optimum water content for these densities range from 14.4 to 23.7 percent (dry weight), however, PARAHO can achieve high densities without requiring water for compaction. Water retention characteristics indicate that optimum moisture contents (field capacity) range from 13 to 14% (dry weight). Water contents in excess of these values are likely to drain with time. PARAHO shale can be considered as semipervious to pervious with permeability values of 1000 to 10,000 cm/s depending on compaction effort. PARAHO shale exhibits self-cementing characteristics. Under normal conditions cementing reactions are slow, with strength gains still indicated after 28 days. The shear strength of PARAHO is comparable to similarly graded gravel with effective angles of internal friction, phi', of 33 to 34 degrees. Depending on compactive effort and gradation of the material, effective cohesion values of 0.09 Mn/sq m to 0.19 MN/sq m (128.05 psi to 277.45 psi) can be expected. DOE

N83-21695# Woodard-Clyde Consultants, San Francisco, Calif.
DESIGN AND DEMONSTRATION OF SUBSIDENCE MONITORING SYSTEMS Final Report
Barbara B. Ranson, John E. ORourke, and Pamela H. Rey Sep. 1982 282 p
(Contract DE-AC01-78ET-12220)
(DE82-021321; DOE/ET-12220/T1) Avail: NTIS HC A13/MF A01

Three instrumentation systems were implemented to monitor subsidence at a 1 coal mine. The instrument systems monitored key parameter needed to evaluate subsidence for both caving and supported mining methods, and surface structure response. The continuous mining method with pillar extraction utilized for mining the 1000 foot deep panel was compatible with the objective of monitoring subsidence associated with both supported and caving conditions; however. The instrumentation included combined borehole extensometer/inclinometer systems for full profile data from the surface to 800 foot depth, microseismic systems to monitor caving and subsurface fracturing over the mined panel, tape extensometers for surface strain, and ground surveys over the mined panel. Monitoring in the mine involved the use of borehole pressure cells, rod extensometers and convergence measurements as well as measurement of in-situ stress by overcoring. DOE

N83-21696# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
AN EXAMINATION OF TWO METHODS FOR ESTIMATING THE TRANSFER OF AEROSOLS FROM THE TROPOSPHERE TO THE EARTH'S SURFACE
Charles W. Miller 1982 14 p refs Presented at the 2nd Symp. on the Composition of the Nonurban Troposphere, Williamsburg, Va., 25 May 1982
(Contract W-7405-eng-26)
(DE82-015376; CONF-820529-4) Avail: NTIS HC A02/MF A01

Two models for predicting the rate at which particles are removed at the troposphere-ground surface interface by non-precipitation processes were examined. DOE

N83-21697# Sandia Labs., Albuquerque, N. Mex.
MILL RACE HIGH ALTITUDE PRESSURE MEASUREMENTS
J. R. Banister, W. V. Hereford, and R. D. Robinett 1982 21 p refs Presented at the DNA-Millrace Symp., Adelphi, Md., 16 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008468; CONF-820313-2) Avail: NTIS HC A02/MF A01

An extensive set of measurements were made to examine the changes of the ionosphere caused by Mill Race. As a part of this program, we obtained time histories of the blast wave at high altitudes. These histories can then be used as input for calculating pulse shapes at greater heights. These data and their scaling implications are discussed in this preliminary report. The high altitude pressure measurements on Mill Race were quite successful. Three pressure measurements were achieved and the fourth pressure history was recovered from the acceleration record. The blast wave showed a classical behavior except for the shock which developed in the negative phase. The close agreement between observation and theory suggests the far field blast wave was symmetric. Observed peak overpressures were consistent with those predicted by using Modified Sachs Scaling. The best agreement was with the curve from nuclear explosion analysis; the observed values were about 15% less than the extrapolated values for AN/FO theoretical curve. DOE

N83-21698# Lamont-Doherty Geological Observatory, Palisades, N. Y.
THE TIME-DEPENDENT TRANSMISSIVITY OF JOINTS Progress Report, 1 Jul. 1981 - 30 Jun. 1982
C. Scholz and T. Engelder Feb. 1982 29 p refs
(Contract DE-AC02-76ER-04054)
(DE82-016264; DOE/ER-04054/6) Avail: NTIS HC A03/MF A01

When rock is subjected to a stress cycle during which cracks open and close, hysteresis is observed in the stress-strain curves, which has usually been attributed to friction. Scanning electron microscope studies, however, have shown that shear cracks are scarce in rock that has been deformed in the dilatant region. Stevens and Holcomb [1980] and Holcomb and Stevens [1980] have argued further that crack friction models are incompatible with the rheology of dilatant rock and are virtually untenable. They asserted instead that cracks are reversible in the sense of the Griffith energy balance. Here we demonstrate that two nominally flat rock surfaces in contact subject to a cycle of applied normal stress exhibit all the properties of crack opening, closing, and hysteresis exhibited by a dilatant rock and that in this case the mechanism must be friction. It is concluded that an axial crack in dilatant rock will exhibit frictional interactions on opening or closing if the crack walls are not in perfect registration, and that there is no justification for accepting the reversible Griffith crack concept. DOE

N83-21699# California Univ., Livermore. Lawrence Livermore Lab.
MAGNITUDES OF SLIP ALONG THE GREENVILLE FAULT IN THE DIABLO RANGE AND CORRAL HOLLOW AREAS
Jerry J. Sweeney Mar. 1982 12 p refs Presented at the Conf. on Earthquake Hazards in the Eastern San Francisco Bay Area, Hayward, Calif., 24-27 Mar. 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-012220; UCRL-87471; CONF-820355-1) Avail: NTIS HC A02/MF A01

A geological description of the Greenville fault is given. The Greenville fault forms the eastern boundary to Livermore Valley and extends into the Diablo Range south of San Antonio Valley, a probable pull-apart structure. Gravity, magnetic, structural, and petrologic data indicate that the serpentinized ophiolite units at Cedar Mountain and Red Mountain were once continuous and are displaced dextrally along the Greenville fault by 9 km. The Livermore Oil Field marks the location of the buried western end of the Corral Hollow anticline which was displaced about 2 km northward along the Greenville fault following deposition and folding of Plio-Pleistocene rocks. Further east, the Corral Hollow syncline was displaced northward about 600 m along the Corral Hollow fault in a similar manner. GRA

N83-21700# Sandia Labs., Albuquerque, N. Mex.
PREDICTION OF HYDRAULIC FRACTURE AZIMUTH FROM ANELASTIC STRAIN RECOVERY MEASUREMENTS OF ORIENTED
L. W. Teufel 1982 6 p refs Presented at 23 US Symp. on Rock Mechan., Berkeley, Calif., 25 Aug. 1982
(Contract DE-AC04-76DP-00789)
(DE82-007762; SAND-82-0351C; CONF-820803-1) Avail: NTIS HC A02/MF A01

An anelastic strain recovery technique is presented as a method of determining the directions and ratio of the maximum and minimum horizontal in situ stresses from oriented cores from deep wells and thus enable prediction of the fracture orientation. A reliable method of predicting the azimuth of massive hydraulic fractures is of great importance to the gas industry in developing low permeability reservoirs. Knowledge of the fracture azimuth would allow optimum location and spacing of wells in a developing field and thus could increase recoveries an additional 30% of the total reservoir. In order to predict the azimuth of a hydraulic fracture, it is necessary to know the direction of the minimum horizontal in situ stress, because a hydraulic fracture propagates perpendicular to this stress direction. DOE

N83-21701# Kansas State Geological Survey, Lawrence.
REGIONAL INTERPRETATION OF KANSAS AEROMAGNETIC DATA
Harold L. Yarger 1982 104 p refs
(Contract DE-AS07-79ET-27204)
(DE83-003219; DOE/ET-27204/T1-Vol-1-Sect-3) Avail: NTIS HC A05/MF A01

The aeromagnetic mapping techniques used in a regional aeromagnetic survey of the state are documented and a qualitative regional interpretation of the magnetic basement is presented. Geothermal gradients measured and data from oil well records indicate that geothermal resources in Kansas are of a low-grade nature. However, considerable variation in the gradient is noted statewide within the upper 500 meters of the sedimentary section; this suggests the feasibility of using groundwater for space heating by means of heat pumps. DOE

N83-21702# Science Applications, Inc., Steamboat Springs, Colo. Applied Geomechanics Div.
STRATIGRAPHIC VARIATIONS IN OIL-SHALE FRACTURE PROPERTIES
Chapman Young, Nancy C. Patti, and Bruce C. Trent Laramie, Wyo. DOE Sep. 1982 78 p refs Prepared in cooperation with Colorado State Univ.
(Contract DE-AP20-82LC-00389)
(DE82-021088; DOE/LC-RI-82-5) Avail: NTIS HC A05/MF A01

The proper design and evaluation of in situ oil shale fracture and retorting experiments which require that both the extreme values and spatial distribution of the controlling rock properties be adequately known are discussed. The prediction, control and evaluation of explosive oil shale fracturing require a detailed knowledge of tensile strength behavior as a function of shale grade and stratigraphic position. Direct pull tensile tests, point load pinch tests, and four point bend fracture toughness tests are utilized to develop detailed logs of the relevant fracture properties for the 37 m thick Mahogany Zone section of the Green River Formation near Anvil Points, Colorado and for the rich, upper 13 m of the Tipton Member near Rock Springs, Wyoming. Statistical analyses were performed on these data and on Fischer assay oil yield data to establish the correlations between them. Data from both tensile strength and fracture energy tests correlate well with lithologic and oil yield characteristics of the Mahogany Zone shale while poor correlations were found for the Tipton shale. DOE

N83-21703# Los Alamos Scientific Lab., N. Mex.
GEOTHERMAL INVESTIGATIONS IN WEST VIRGINIA

Robert Hendry, Kenneth Hilfiker, Dennis Hodge, Paul Morgan, Chandler Swanberg, and Spencer S. Shannon, Jr. Nov. 1982 58 p refs Prepared in cooperation with State Univ. of New York at Buffalo, Amherst and Lunar and Planetary Inst., Houston, Tex.
(Contract W-7405-eng-36)
(DE83-004480; LA-9558-HDR) Avail: NTIS HC A04/MF A01

Deep sedimentary basins and warm spring systems in West Virginia which are potential geothermal resources are described. A temperature gradient map based on 800 bottom hole temperatures for West Virginia shows that variations of temperature gradient trend northeasterly, parallel to regional structure. Highest temperature gradient values of about 280C/km occur in east central West Virginia, and the lowest gradients (180C/km) are found over the Rome Trough. Groundwater geochemistry indicates that the warm waters circulate in very shallow aquifers and are subject to seasonal temperature fluctuations. Silica heat flow data in West Virginia vary from about 0.89 to 1.4 HFU and generally increase towards the west. Bouguer, magnetic, and temperature gradient profiles suggest that an ancient rift transects the state and is the site of several deep sedimentary basins. DOE

N83-21704# Colorado School of Mines, Golden. Dept. of Geophysics.
RESEARCH ON THE PHYSICAL PROPERTIES OF GEOTHERMAL RESERVOIR ROCKS Final Report
George V. Keller and A. W. Ibrahim Oct. 1982 27 p refs
(Contract DE-AC02-76ET-28366)
(DE83-004514; DOE/ET-28366/5) Avail: NTIS HC A03/MF A01

Variation of P-wave velocities and electrical resistivities of several suites of water saturated volcanics was investigated. Both P velocities and resistivities exhibited strong dependence on porosity. Resistivity was also dependent upon degree of water saturation and temperature. P wave velocities, while showing a strong dependence on porosity, appear to be independent of water saturation and temperature. Volcanics, in general, exhibit higher resistivities compared to other igneous rocks and sediments. Electric resistivity of fine grained basalts is anomalously low, probably due to higher content of disseminated iron. Pyroclastics and volcanic breccia, on the other hand, exhibit higher resistivities in relation to fine grained basalts. DOE

N83-21705# Sandia Labs., Albuquerque, N. Mex. NTS Waste Management Overview Div.
GEOLOGY OF THE NEVADA TEST SITE AND NEARBY AREAS, SOUTHERN NEVADA
Scott Sinnock Oct. 1982 55 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002528; SAND-82-2207) Avail: NTIS HC A04/MF A01

The geological setting of the Nevada Test Site (NTS) in the context of the current waste isolation policy is discussed. The intent is to provide a synthesis of geological conditions at the NTS and nearby areas so that a general background of information is available for assessing the possible role of geology in providing protections for humans from buried radioactive wastes. The NTS is characterized by alluvium filled, topographically closed valleys surrounded by ranges composed of Paleozoic sedimentary rocks and Tertiary volcanic tuffs and lavas. The Paleozoic rocks are a miogeosynclinal sequence of about 13,000 ft of pre-Cambrian to Cambrian clastic deposits (predominantly quartzites) overlain by about 14,000 ft of Cambrian through Devonian carbonates, 8000 ft of Mississippian argillites and quartzites, and 3000 ft of Pennsylvanian to Permian limestones. Tertiary volcanic rocks are predominantly silicic composition and were extruded from numerous eruptive centers during Miocene and Pliocene epochs. Within eruptive caldera depressions, volcanic deposits accumulated to perhaps 10,000 ft in total thickness, thinning to extinction outward from the calderas. DOE

N83-21706# National Oceanic and Atmospheric Administration, Boulder, Colo.
NEW CATALOG OF STRONG EARTHQUAKES IN THE USSR FROM ANCIENT TIMES THROUGH 1977
N. V. Kondorskaya, ed., N. V. Shebalin, ed., Ye. A. Khrometskaya, ed., and A. D. Gvishiani, ed. Jul. 1982 620 p refs Prepared in cooperation with Academy of Sciences (USSR), Moscow
(PB83-119206; SE-31; NOAA-82101304) Avail: NTIS HC A99/MF A01 CSCL 08K

This report is the first, as well as the most complete, summary of data on earthquakes in the USSR and neighboring regions to be published in English. The first (Russian) edition of the 'New Catalog,' which contained data only through 1974, was modified by the editors for the present publication with substantial additions and revisions. Data for strong earthquakes in 1975-77 have been included, as well as additional information from published sources that became available to the editors after 1976. GRA

N83-21707# Swedish Inst. for Materials Testing, Boras.
PROBLEMS RELATED TO SEISMIC TESTING OF STRUCTURES. A CASE STUDY
Hans Broberg, Gunnar Kjell, and Christer Ljung 1982 34 p refs
(PB83-113928; SP-RAPP-1982:17; ISSN-0280-2503) Avail: NTIS HC A03/MF A01 CSCL 08K

Seismic verification of a structure by application of true earthquake motions is not practicable. Expected ground motions due to seismic events vary with geographic location, mounting conditions differ, etc. Consequently, it is often essential to give the structure a seismic classification which is as general as possible. Deterministic signals will be preferred, e.g. sine beat and sine sweep functions. The problem is then to connect the parameters of the test signal with the characteristic properties of an assumed earthquake-induced motion. This is generally effected by comparing responses of linear single-degree-of-freedom (SDOF) systems to the two types of signals. In structures with several degrees of freedom, where the modes of motion are coupled, or in systems with significantly non-linear properties, the accuracy of the comparison is disturbed. Author (GRA)

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-21708*# Scripps Institution of Oceanography, La Jolla, Calif. Climate Research Group.
THE NONLINEAR RESPONSE IN A BAROCLINIC MODEL TO STATIONARY FORCINGS Final Report, 1 Oct. 1980 - 31 Dec. 1982
John O. Roads 1982 10 p
(Contract NAG5-105)
(NASA-CR-170098; NAS 1.26:170098) Avail: NTIS HC A02/MF A01 CSCL 04B

Wave-zonal-flow interaction studies demonstrated that stratospheric warnings and blocking may be described by the same basic mechanisms although different results occurred for different horizontal scales. Author

N83-21709*# California Univ., La Jolla. Climate Research Group.
CLOUD/CLIMATE SENSITIVITY EXPERIMENTS
John O. Roads, Geoffrey K. Vallis, and Lorraine Remer 1982 50 p refs Presented at the 4th Biennial Ewing Symp., Palisades, N.Y., 25-27 Oct. 1982
(Contract NAG5-105)
(NASA-CR-170096; NAS 1.26:170096) Avail: NTIS HC A03/MF A01 CSCL 04B

A study of the relationships between large-scale cloud fields and large scale circulation patterns is presented. The basic tool is a multi-level numerical model comprising conservation equations for temperature, water vapor and cloud water and appropriate parameterizations for evaporation, condensation, precipitation and radiative feedbacks. Incorporating an equation for cloud water in a large-scale model is somewhat novel and allows the formation and advection of clouds to be treated explicitly. The model is run on a two-dimensional, vertical-horizontal grid with constant winds. It is shown that cloud cover increases with decreased eddy vertical

velocity, decreased horizontal advection, decreased atmospheric temperature, increased surface temperature, and decreased precipitation efficiency. The cloud field is found to be well correlated with the relative humidity field except at the highest levels. When radiative feedbacks are incorporated and the temperature increased by increasing CO2 content, cloud amounts decrease at upper-levels or equivalently cloud top height falls. This reduces the temperature response, especially at upper levels, compared with an experiment in which cloud cover is fixed. Author

N83-21710*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LINEAR RETRIEVAL AND GLOBAL MEASUREMENTS OF WIND SPEED FROM THE SEASAT SMMR
Prem Chand Pandey 1 Mar. 1983 31 p refs
(NASA-CR-170115; JPL-Pub-83-5; NAS 1.26:170115) Avail: NTIS HC A03/MF A01 CSCL 04B

Retrievals of wind speed (WS) from Seasat Scanning Multichannel Microwave Radiometer (SMMR) were performed using a two-step statistical technique. Nine subsets of two to five SMMR channels were examined for wind speed retrieval. These subsets were derived by using a leaps and bound procedure based on the coefficient of determination selection criteria to a statistical data base of brightness temperatures and geophysical parameters. Analysis of Monsoon Experiment and ocean station PAPA data showed a strong correlation between sea surface temperature and water vapor. This relation was used in generating the statistical data base. Global maps of WS were produced for one and three month periods. Author

N83-21711*# FWG Associates, Inc., Tullahoma, Tenn.
FLIGHT IN LOW-LEVEL WIND SHEAR Final Report, 22 Jun. 1981 - 22 Aug. 1982
Walter Frost Washington NASA Mar. 1983 120 p refs
(Contract NAS8-33458)
(NASA-CR-3678; NAS 1.26:3678) Avail: NTIS HC A06/MF A01 CSCL 04B

Results of studies of wind shear hazard to aircraft operation are summarized. Existing wind shear profiles currently used in computer and flight simulator studies are reviewed. The governing equations of motion for an aircraft are derived incorporating the variable wind effects. Quantitative discussions of the effects of wind shear on aircraft performance are presented. These are followed by a review of mathematical solutions to both the linear and nonlinear forms of the governing equations. Solutions with and without control laws are presented. The application of detailed analysis to develop warning and detection systems based on Doppler radar measuring wind speed along the flight path is given. A number of flight path deterioration parameters are defined and evaluated. Comparison of computer-predicted flight paths with those measured in a manned flight simulator is made. Some proposed airborne and ground-based wind shear hazard warning and detection systems are reviewed. The advantages and disadvantages of both types of systems are discussed. N.W.

N83-21712# Committee on Science and Technology (U. S. House).
CARBON DIOXIDE AND CLIMATE: THE GREENHOUSE EFFECT
Washington GPO 1982 154 p refs Hearing before the Subcomm. on Natural Resources, Agr. Res. and Environ. and the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., no. 115, 25 Mar. 1982
(GPO-98-227) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

A worst case scenario of atmospheric carbon dioxide is discussed. N.W.

N83-21713*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va. Field Measurement Support Office.
METEOROLOGICAL AND CONSTITUENT DATA FOR JUNE, JULY AND AUGUST 1981
20 Oct. 1981 139 p refs
(NASA-TM-85279; WFC-032.1-81-109; NAS 1.15:85279) Avail: NTIS HC A07/MF A01 CSCL 04B

Electrochemical conversion cell (ECC) balloon data consisting of a plot showing the mixing ratio of ozone partial pressure and temperature versus pressure altitude are included. Author

N83-21714*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
METEOROLOGICAL AND CONSTITUENT DATA FOR SEPTEMBER - DECEMBER 1981
15 Mar. 1982 68 p
(NASA-TM-85277; WFC-1032.1-82-115; NAS 1.15:85277) Avail: NTIS HC A04/MF A01 CSCL 04B

Ozone data acquired for the Wallops Flight Center Field Measurement Support Office from Wallops Island, Virginia; Natal, Brazil; Poker Flat, Alaska and Primrose Lake, Canada are provided. No correction factor is applied to the electrochemical concentration cell (ECC) values to bring them into agreement with the Dobson readings. Author

N83-21715*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
METEOROLOGICAL AND CONSTITUENT DATA, JANUARY - APRIL 1982
23 Jun. 1982 106 p refs
(NASA-TM-85286; WFC-1032.1-82-119; NAS 1.15:85286) Avail: NTIS HC A06/MF A01 CSCL 04B

Ozone and temperature data acquired at Wallops Island, Natal, Brazil and Primrose Lake, Canada using electrochemical concentration cell (ECC) balloon ozonesondes are provided. Author

N83-21716*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
METEOROLOGICAL AND CONSTITUENT DATA FOR MARCH, APRIL AND MAY 1981
20 Oct. 1981 89 p
(NASA-TM-85276; WFC-032.1-81-110; NAS 1.15:85276) Avail: NTIS HC A05/MF A01 CSCL 04B

Data acquired by Wallops Flight Center's Field Measurement Support Office (FMSO) from Wallops Island, Virginia; Poker Flat, Alaska; Natal, Brazil; and Primrose Lake, Canada are provided. The data was processed at Wallops Flight Center. No correction factor was applied to the electrochemical concentration cell (ECC) values to bring them into agreement with the Dobson readings. Author

N83-21717# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
RADAR METEOROLOGY IN CLOUD PHYSICS AND RADIO WAVE PROPAGATION RESEARCH
Arno Schroth Jun. 1982 343 p refs in GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-808)
(DEVLR-Mitt-82-09; ESA-TT-808) Avail: NTIS HC A15/MF A01; DFVLR, Cologne DM 91,90

After a brief discussion of the tasks for weather radars in meteorology and radio wave propagation research, the most important stages of development beginning with the standard weather radar up to the agile coherent polarization-diversity radar, the sensor of the future, are presented. The basic design, the range of application and the limitations of the different devices are investigated. The latest theorie for the system design of a coherent polarization radar and the interpretation of the measured data is shown in detail. The essential parameters and their influences on the design of such devices are discussed. A proposal for realization and the values of the significant radar parameters are given. Author (ESA)

N83-21718# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: HELLENIKON AB,

GREECE Final Report
29 Jul. 1982 500 p
(AD-A122712; AD-E850205; USAFETAC/DS-82/046) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Hellenikon AB, Greece. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus Visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and mimimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperature and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N83-21719# Bras (Rafael L.), Lexington, Mass.
A METHODOLOGY FOR ANALYZING THE EFFECT OF HYDROMETEOROLOGY OF THE CONTIGUOUS UNITED STATES ON GOES RANDOM DATA COLLECTION SYSTEM Final Report, 30 Dec. - Aug. 1981
Rafael L. Bras, Donald Grossman, and David Schafer Army Corps of Engineers Aug. 1982 217 p refs
(Contract DACW33-82-C-0011)
(AD-A122629) Avail: NTIS HC A10/MF A01 CSCL 04/2

A methodology and guidelines for the design of a randomly reporting network of data collection platforms is given. The system assumes the use of GOES satellites as retransmitors. A full review of the communication literature dealing with random and contention protocols is included. Also included is an analysis of extensive daily precipitation records over the conterminous United States leading to probabilistic statements of rainfall occurrence.
Author (GRA)

N83-21720# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OCCURRENCE OF FOEHNS IN THE WEST BIESZCZADY MOUNTAINS
Adam Malicki and Edward Michna 4 Nov. 1982 12 p refs Transl. into ENGLISH from Ann. Univ. Mariae Curie-Skodowska, Sect. B, Geogr., Geol., Mineral. et Petrogr. (Poland), v. 21, no. 6, 1966 p 133-142
(AD-A122787; FTD-ID(RS)T-1590-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

The occurrence of foehns in the Carpathian mountains were studied. Special manifestations of foehns were observed during the first months. Preliminary observations of the foehns are presented. GRA

N83-21721# Pacific Northwest Lab., Richland, Wash.
CLIMATE SELECTION AND DEVELOPMENT OF CLIMATE INDICATORS
W. M. Bowen, S. Moreno (Gilford, Deringer and Co.), and A. R. Olsen Sep. 1982 120 p refs
(Contract DE-AC06-76RL-01830)
(DE83-000396; PNL-4435) Avail: NTIS HC A06/MF A01

A climate analysis procedure for selecting climate locations which would represent the variation in climate conditions throughout the United States is documented. Separate energy analysis projects for three building categories were to use the results of the climate location project. The categories are: commercial buildings (including multifamily residences), single family residences, and mobile homes. The overall objectives, approach, and method used for all three categories are presented, then the specific application of the general method to each building category is discussed. Climate selection results, conclusions, recommendations, and limits for each building category are presented within the description of the application of the method for that category. DOE

N83-21722# Vitro Labs., West Orange, N.J.
SEPTEMBER 1982 ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK
Sep. 1982 65 p
(Contract DE-AC01-79CS-30027)
(DE83-001839; SOLAR/0010-82/09) Avail: NTIS HC A04/MF A01

Environmental data are tabulated for 14 sites. The data include insolation, temperature, wind, and relative humidity data. Also included is a technical discussion of the instruments used in taking the data. DOE

N83-21723# Pacific Northwest Lab., Richland, Wash.
VERTICAL EXTRAPOLATIONS OF WIND SPEED
J. C. Doran, J. W. Buck, and S. K. Heflick Sep. 1982 61 p refs
(Contract DE-AC06-76RL-01830)
(DE83-000944; PNL-4361) Avail: NTIS HC A04/MF A01

The extrapolation of wind speeds and wind speed distributions from a lower to an upper level is examined, with particular emphasis on the power law approach. While the power laws are useful for representing the behavior of winds under a variety of conditions, they are shown to be inherently incorrect and misleading for extrapolations. The law's apparent simplicity nevertheless makes it attractive for certain purposes, and its performance at a number of windy sites is tested. The principal feature seems to be the large degree of scatter found from site to site, and even at a single site from one time to the next. Part of this is attributable to the effects of stability, as is seen by no means eliminated by this division. The behavior of the power law exponents is poorer still in complex terrain. While some general tendencies of these exponents can be found, their use cannot be recommended for anything more than a preliminary or rough estimate of wind speeds. Extrapolation formulas for Weibull distributions are also tested with the same data base. DOE

N83-21724# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
NUMERICAL SIMULATIONS OF MESOSCALE PRECIPITATION SYSTEMS Final Technical Report, 15 Aug. 1964 - 31 Oct. 1978
A. Nelson Dingle 12 May 1982 139 p refs
(Contract DE-AC02-76EV-01407)
(DE82-016235; DOE/EV-01407/T1) Avail: NTIS HC A07/MF A01

A numerical model designed for the study of mesoscale weather phenomena is presented. It is a three dimensional, time-dependent model based upon a mesoscale primitive-equation system, and it includes parameterizations of cloud and precipitation processes, boundary-layer transfers, and ground surface energy and moisture budgets. This model was used to simulate the lake-effect convergence over and in the lee of Lake Michigan in late fall and early winter. The lake-effect convergence is created in advected cold air as it moves first from cold land to the warm constant-temperature lake surface, and then on to cold land. A numerical experiment with a prevailing northwesterly wind is conducted for a period of twelve hours. Two local maxima of the total precipitation are observed along the eastern shore of Lake Michigan. The results in this hypothetical case correspond quite well to the observed precipitation produced by a real event in which the hypothetical conditions are approximately fulfilled. DOE

N83-21725# Oak Ridge National Lab., Tenn. Computer Sciences.
MODELING THE TROSPHERIC WIND FIELD OVER COMPLEX TERRAIN
J. T. Holdeman 1982 4 p refs Presented at the 2nd Symp. on the Composition of the Nonurban Troposphere, Williamsburg, Va., 25 May 1982
(Contract W-7405-eng-26)
(DE82-015692; CONF-820529-5) Avail: NTIS HC A02/MF A01

A model was developed for wind fields over complex terrain. It was developed for use with a particle-in-cell model for pollutant

transport, dispersion, interaction, and removal. Terrain adjustment and adjustment weights are discussed. DOE

N83-21726# Ebasco Services, Inc., New York.
LIGHTNING RESEARCH PLAN Final Report
D. A. Mark Mar. 1982 121 p refs Sponsored by EPRI
(EPRI Proj. 1980-1)
(DE82-903144; EPRI-EL-2289) Avail: NTIS HC A06/MF A01

The objective is to prepare a comprehensive, coordinated and cost effective plan for undertaking future lightning research projects that will be applicable to the improvement of distribution system surge protection. The main investigative work of the project included the following: state of the art study in lightning research to determine the availability of lightning stroke data and instruments for data gathering; the use of analytical methods in distribution system surge protection and the need for further analytical work; and identification of research performed by others and its applicability to the utility industry. The results of these investigations are used in the proposed research plan that incorporates the recommended projects, identifies priorities and expected costs. DOE

N83-21727# Duke Univ., Durham, N. C. Dept. of Botany.
RESPONSE OF UNMANAGED ECOSYSTEMS. VOLUME 2. PART 12 OF ENVIRONMENTAL AND SOCIETAL CONSEQUENCES OF A POSSIBLE CO2-INDUCED CLIMATE CHANGE
Boyd R. Strain and Thomas V. Armentano (The Institute of Ecology) Oct. 1982 52 p refs 2 Vol.
(Contract DE-AS01-79EV-10019)
(DE83-002886; DOE/EV-10019/12-Vol-2) Avail: NTIS HC A04/MF A01

It is sometimes claimed that the increasing concentration of atmospheric CO2 will increase the rate of global carbon storage by increasing the rate of photosynthesis and of biomass production. This is doubtful because the rate of biomass production already is generally limited by factors other than CO2 concentration, such as water, light, nutrients (especially N), and habitat space. Thus, although there may be some increase in net photosynthesis in some ecosystems the increase probably will not be converted into stored carbon because it probably will be accompanied by increased decomposition. A reliable estimate of possible changes in carbon storage requires information concerning the entire metabolic pathway of carbon in ecosystems. Although increase in CO2 concentration probably will not cause important changes in global carbon storage it may cause changes in the species composition of ecosystems by changing relative rates of growth of the various species. DOE

N83-21728# Pacific Northwest Lab., Richland, Wash.
A WEATHER-PATTERN CLIMATOLOGY OF THE GREAT PLAINS AND THE RELATED WIND REGIME
W. R. Barchet Nov. 1982 54 p
(Contract DE-AC06-76RL-01830)
(DE83-004408; PNL-4330) Avail: NTIS HC A04/MF A01

The meteorology of the Great Plains can be described as a constant progression of air masses, fronts and cyclonic storm systems. Each of these meteorological conditions can be characterized by identifiable isobaric and related weather parameter patterns. Nine such patterns were defined to type the weather patterns in the Great Plains. Time series of weather pattern types were produced for 62 stations on the Great Plains. Statistical analyses of these time series produced annual and seasonal frequencies of occurrence to the weather pattern types. Maps of the annual and seasonal frequency of occurrence of weather pattern type are presented for the Great Plains. Persistence and alternation frequencies match what is expected for traveling temperate latitude cyclones, anticyclones and fronts. The wind regime for stations at which the anemometer height and location was constant (and known) for a minimum of three consecutive years was stratified by weather pattern type. Statistical analyses were made to show the response of the wind to the large-scale distribution of air pressure associated with a weather pattern type. DOE

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N83-21729# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Inst. fuer Optoelektronic.
DETERMINATION OF SPREADING PARAMETERS OVER THE SEA SURFACE BY LIDAR MEASURES Final Report, Feb. 1979 [BESTIMMUNG VON AUSBREITUNGSPARAMETERN UEBER MEERESOBERFLAECHEN AUS LIDARMESSUNGE]
Hartmut Herrmann, Michael Klier, Friedrich Koepp, and Christian Werner Bonn Bundesministerium der Verteidigung Feb. 1982 117 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVG-FBWT-82-2) Avail: NTIS HC A06/MF A01; DOKZENTBW, Bonn, DM 40

The dispersion of artificial aerosol plumes over sea surfaces was measured, using a shipborne lidar system. The momentary distribution of aerosol concentrations and some dispersion parameters could be derived from shorttime measurements. Moreover, some effects of aerosol type and sea surface on the plume dispersion were estimated. Measurements under different elevation angles were possible using the stabilized Minilidar. Measurements from one position of the plume during longer times were carried out. Results are presented. Author

N83-21730*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GREENLAND 1979 MICROWAVE REMOTE SENSING DATA CATALOG REPORT, 14-15 OCTOBER 1979
Harold F. Hennigar (Deepsea Ventures, Inc., Gloucester Point, Va.), William S. Hirstein (Bionetics Corp., Hampton, Va.), Sally K. Schaffner (OAO Corp., Hampton, Va.), Victor E. Delnore (Kentron International, Inc., Hampton, Va.), and William L. Grantham Mar. 1983 64 p refs
(NASA-TM-84571; L-15529; NAS 1.15:84571) Avail: NTIS HC A04/MF A01 CSCL 08C

Microwave remote sensing measurements were cataloged for active and passive instruments in support of the 1979 Greenland Remote Sensing Experiment. Instruments used in this field experiment include the stepped frequency microwave radiometer (4 to 8 GHz) and the airborne microwave scatterometer (14.6 GHz). The microwave signature data are inventoried and cataloged in a user friendly format and are available on 9 track computer compatible tapes upon request. Author

N83-21731*# Woods Hole Oceanographic Institution, Mass.
WARM WATER MASS FORMATION
G. T. Csanady [1982] 58 p refs
(Grant NAG5-185)
(NASA-CR-170117; NAS 1.26:170117) Avail: NTIS HC A04/MF A01 CSCL 08J

Seasonal heat storage, massive upwelling, and cold water advection are shown by a thermodynamic model of the interacting atmospheric and oceanic mixed layers. Author

N83-21732# Delft Hydraulics Lab. (Netherlands). Head Harbours and Coasts Branch.
BEACH AND DUNE EROSION DURING STORM SURGES
P. Vellinga Aug. 1982 32 p refs
(Publ-276) Avail: NTIS HC A03/MF A01

The set-up and results of an extensive research program concerning the erosion of coastal dunes during storm surges is presented. A large number of two dimensional and three dimensional mobile bed model tests was carried out to investigate the process of dune erosion. The state of art after a series of small scale tests is summarized. Attention is focussed on large scale tests carried out in the Delta Flume with random waves up to 2 m significant height. Sediment concentration and orbital velocity measurements are discussed. The large scale tests confirmed the validity of a modelling technique based on the dimensionless fall

velocity parameter H/Tw. The safety of existing coastal dunes as a water-retaining structure that has to protect the major part of the Netherlands from inundation during storm surges is addressed. Author

N83-21733# New Brunswick Univ., Fredericton. Dept. of Surveying Engineering.
THE ZERO FREQUENCY RESPONSE OF SEA LEVEL TO METEOROLOGICAL INFLUENCES
C. L. Merry and P. Vanicek Oct. 1981 89 p refs Sponsored in part by Canadian Natl. Sci. and Eng. Res. Council, and by South African Council for Sci. and Ind. Res. Postdoctrinal Scholarship (TR-82) Avail: NTIS HC A05/MF A01

The permanent response of the sea level to phenomena such as atmospheric pressure, temperature, wind, and river discharge was determined. Author

N83-21734# Scripps Institution of Oceanography, La Jolla, Calif.
NOTES ON THE DESIGN AND OPERATION CHARACTERISTICS OF THE APPARATUS FOR THE EAST PACIFIC RISE ELECTROMAGNETIC ACTIVE SOURCE EXPERIMENT
Peter D. Young Nov. 1982 70 p refs
(Contract N00014-75-C-0999; Grant NSF OCE-78-14524)
(AD-A122530; SIO-REF-81-16) Avail: NTIS HC A04/MF A01 CSCL 08/10

A transmitter assembly is described which consists of four parts; the power supply and waveform control on shipboard, the cable delivering the power and the control signals from shipboard through roughly 3 kilometers of seawater to the transformer pressure casing near the seafloor, the electronics within this casing that transform and rectify the power coming down the cable and chop it into the waveform indicated by the control signals, and the lengths of cable lying along the ocean bottom that make up the transmitter antenna. The complete transmitter assembly is illustrated and its parts are described in the text. GRA

N83-21735# Coast Guard, Washington, D.C. Oceanographic Unit.
A TWO DIMENSIONAL MODEL OF WIND FORCED INERTIAL OSCILLATIONS
Bruce E. Viekman 1982 24 p refs
(AD-A122401; CGOU-TR-82-3) Avail: NTIS HC A02/MF A01 CSCL 08/10

A two dimensional model of wind driven inertial oscillations is formulated. The equations for current velocity model the wind stress as a body force, and are vertically integrated in accordance with the slab flow concept. Two dissipation terms are included, one first order and second order term. A linear constant of proportionality is used for each. The changing nature of the thermocline is modeled using the equations of Denman (1973). A general algorithm is used for the solar radiative flux. A number solution is developed for the system of equations. The portion of the model dealing with thermocline changes is tested against data from Ocean Station Papa. A good fit is obtained, with coefficients similar to those found by Denman and Miyake (1973). Current velocities were tested against moored data using progressive vector diagrams. A good fit is obtained. The four day damping of Pollard and Millard (1970) is supported. An experimental design is proposed to obtain two dimensional data for the testing of this type of model. Author (GRA)

N83-21736# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
SEASAT SAR SEA ICE IMAGERY FROM SUMMER MELT TO FALL FREEZE-UP Final Report
R. D. Ketchum, Jr. Nov. 1982 17 p refs
(AD-A122675; NORDA-TN-178) Avail: NTIS HC A02/MF A01 CSCL 08/12

Some salient aspects of SEASAT L-band SAR sea ice imagery are presented. High backscatter attributed to water-saturated surface layers reduces the ability to interpret ice conditions. Slush on water areas produces a strong backscatter which could be misinterpreted as rubble, but sequential imagery and floe sizes and shapes can be used to resolve this ambiguity. The slush effect may enhance identification of active zones. Decreasing air temperatures during fall freeze-up reduces background clutter increasing the ability to discern floe sizes and shapes. Higher SAR frequencies being considered for future satellites will show greater backscatter variations for different ice types, but many ambiguities will occur and the ability to discern ridges and floe sizes and shapes will be reduced in the marginal ice zones where interannual weather fluctuations will adversely affect surface scattering properties. Author (GRA)

N83-21737# Miami Univ., Fla.
CARBON DIOXIDE EFFECTS RESEARCH AND ASSESSMENT PROGRAM. WORKSHOP ON OCEANIC CO2 STANDARDIZATION
H. Gote Oestlund, ed. and David Dryssen, ed. (Goteborg Univ.) Feb. 1982 121 p refs Workshop held in LaJolla, Calif., 30 Nov. - 1 Dec. 1979
(Contract DE-FG05-78EV-10140)
(DE82-009070; CONF-7911173) Avail: NTIS HC A06/MF A01

Activities related to the Geochemical Ocean Sections Study (GEOSECS) are reported. For individual titles, see N83-21738 through N83-21747.

N83-21738# Goeteborg Univ. (Sweden).
STANDARDS FOR HYDROCHLORIC ACID-SODIUM CHLORIDE SOLUTIONS
David Dryssen *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 5-8 refs (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

Tris(hydroxymethyl)aminomethane, potassium hydrogen carbonate, sodium carbonate, 4-Aminopyridine ($C_5H_6N_2$), and atmospheric carbon dioxide are discussed. Author

N83-21739# Institute of Ocean Sciences, Victoria (British Columbia). Marine Carbon Research Centre.
REFERENCE SEAWATER
C. S. Wong *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 9-10 ref (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

A reference seawater should be made available for frequent checking of the performance of the whole procedure of total CO2 analysis. In order to be effective for this approach, the seawater must be available as a reference standard in its natural state, including its normal gaseous and dissolved constituents, rather than a reconstituted sea water, such as the Copenhagen Sea water of N.I.O. Standard seawater for salinity. These reconstituted media went through a large number of steps which would alter the characteristics through heating, aeration and aging. The total CO2 in such reference must be as close to the natural concentrations as possible. Perhaps two reference standards should be developed: one surface seawater (low nutrients, low alkalinity, high organic matter, high oxygen) and one deep seawater (high nutrients, high alkalinity, low in easily decomposible organics, high in refractory organics, lower oxygen). The concept is to capture a body of water in its natural state, sub-sampled into bottle immediately and preserved by adding HgCl2, Cd salts or cyanides. Author

N83-21740# Goeteborg Univ. (Sweden).
COMPUTER GENERATED DATA SETS FOR THE POTENTIOMETRIC TITRATION OF TOTAL ALKALINITY IN A TYPICAL SURFACE SEAWATER SAMPLE AND A TYPICAL BOTTOM SEAWATER SAMPLE
David Dryssen and O. Johansson *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 11-24 refs (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

It was deemed interesting to generate a theoretical set of titration data, E mV vs. ml titrant added. The calculations were performed with the omputer program HALTAFALL. The calculations

were performed as a titration of 100 ml seawater with v ml 0.7000 M hydrochloric acid. Two different sets of titration data were generated. The total concentrations, expressed in moles/kg seawater, are specified and the stability constants used are given. Input data for the HALTFALL calculations are shown. Author

N83-21741# Scripps Institution of Oceanography, La Jolla, Calif.
A NEW METHOD FOR THE DETERMINATION OF SIGMA CO2 AND pCO2 BY GAS CHROMATOGRAPHY
Ray Weiss *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 25-31 ref (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

A new gas-chromatographic technique for the direct measurement of part-per-million to part-per-thousand concentrations of carbon dioxide in air and in other gases was developed. The method derives its sensitivity and stability from the simultaneous use of palladium and nickel catalysts for the removal of oxygen and the conversion of CO2 to CH4 for analysis by flame ionization. Hydrogen carrier gas is generated electrolytically from deionized water, thus eliminating the need for carrier gas cylinders. After cleanup with Ascarite and silica gel to remove CO2 and water vapor, the carrier flows at approx 55 ml/min through a custom-built thermostatted gas sampling module. The sampling module is automated and is programmed to sample four separate streams of gas sequentially: an air standard, outside air, an enriched high air standard, and gas equilibrated with surface water. To eliminate memory effects, each type of sample is dried by a separate P2O5 Aquasorb drying column. Author

N83-21742# Institute of Ocean Sciences, Sidney (British Columbia). Marine Carbon Research Centre.
INFRARED DETERMINATION OF TOTAL CO2
C. S. Wong *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 32-36 refs (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

A new generation of infrared instrument without removal of water vapor, developed recently for aircraft CO2 studies consists of a thermal VACHROMIUM infrared emitter at 1000 K, with the infrared radiation projected by a LiF2 window through a 130 mm absorption cell refocussed by another LiF2 lens onto a HgCdTe infrared detector, cooled thermoelectrically to about -15 C. A regulated spinning-wheel chopper creates pulsed signals trans mitted through 3 bandpass filters at 2.6 microns (H2O), 4.2 microns (CO2 and H2O) and 3.6 microns. The reference channel at 3.6 microns insensitive to both H2O and CO2, permits compensation for noise and drift of both the IR-emitter and the detector. The system is enclosed in an aluminum cylindrical casing previously flushed with N2 and kept dry by a dessicant and CO2 free by means of a CO2 absorber. The H2O interference can be assessed at 2.6 microns and subtracted electronically at the 4.2 microns wavelength to yield the net CO2 signal. Author

N83-21743# Goeteborg Univ. (Sweden).
DETERMINATION OF TOTAL CARBONATE AND TOTAL ALKALINITY IN SEAWATER BY MEANS OF PHOTOMETRIC TITRATION
Leif Anderson *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 37-41 ref (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

Seawater was titrated with hydrochloric acid subsequent to the addition of a suitable acid-base indicator. The four solenoid valves were connected to the different solutions by Teflon tubings (2.0 mm ID). The dynamic flow resistance is held as low as possible to avoid a too low underpressure thus avoiding bubble formation when the piston is going down. Author

N83-21744# Scripps Institution of Oceanography, La Jolla, Calif.
HISTORY AND DEVELOPMENT OF THE GEOSECS ALKALINITY TITRATION SYSTEM
David Bos and Robert Williams *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 42-59 ref (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

A history of the alkalinity titrators as used on the GEOSECS Expeditions is provided. The problems encountered and their solutions and modifications which were made throughout the expeditions are discussed. Author

N83-21745# Woods Hole Oceanographic Institution, Mass.
THE TITRATION OF SEAWATER WITH STRONG ACID: AN EVALUATION OF THE GEOSECS TOTAL CARBON DIOXIDE - ALKALINITY POTENTIOMETRIC TITRATION PROCEDURE
Alvin L. Bradshaw and Peter G. Brewer *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 60-88 refs (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

The equations used in the GEOSECS programs for locating the equivalence points of the potentiometric titrations are investigated. These equations are compared with theoretical models and with the best equations available to date. Several titrations are recalculated from the raw E.M.F. data in order to evaluate any error deriving from these sources. Author

N83-21746# Lamont-Doherty Geological Observatory, Palisades, N. Y.
REPRODUCIBILITY AND INTERNAL CONSISTENCY OF CARBONATE CHEMISTRY MEASUREMENTS AT GEOSECS INTERCALIBRATION STATION, 28.5 DEG N AND 121.5 DEG W IN THE EASTERN PACIFIC OCEAN
Taro Takahashi, Robert T. Williams (Scripps Inst. of Oceanography, San Diego, Calif.), Peter G. Brewer (Woods Hole Oceanographic Inst.), David Bos (Scripps Inst. of Oceanography, San Diego, Calif.), Alvin L. Bradshaw (Woods Hole Oceanographic Inst.), David W. Chipman, and R. F. Weiss *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1982 p 89-44 refs (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

The alkalinity, total inorganic CO2 concentration and partial pressure of CO2 in seawater were repeatedly measured at the Intercalibration Station located at 28.5 deg N and 121.5 deg W in the eastern Pacific Ocean. The reproducibility and internal consistency of these three carbonate chemistry parameters measured in the water samples collected during these four expeditions are discussed. Author

N83-21747# Scripps Institution of Oceanography, La Jolla, Calif.
THE GEOSECS GAS CHROMATOGRAPHIC SIGMA CO2 MEASUREMENTS
Ray Weiss *In* Miami Univ. Carbon Dioxide Effects Res. and Assessment Program Feb. 1983 p 115-119 ref (For primary document see N83-21737 11-48)
Avail: NTIS HC A06/MF A01

Measurements of total inorganic carbon during the GEOSECS Atlantic and Pacific expeditions were carried out by titration and gas chromatography. In the chromatographic technique, a 2 ml aliquot of seawater was acidified and stripped of its dissolved gases by a continuous flow of helium carrier gas. The CO2 in the sample was then separated and detected by classical chromatographic techniques. The usual practice during the GEOSECS expeditions was to match the sample analyses with an approximately equal number of standard gas injections to calibrate the sensitivity of the instrument. These calibrations were carried out in groups of 5 to 10 sequential injections interspersed throughout the period required to analyze the complete set of seawater samples from each station. In addition, standard Na2CO3 solutions were prepared at each station using Na2CO3 which had been preweighed in the shorebased laboratory after drying to constant weight. The shipboard solutions were prepared volumetrically using calibrated glassware, and the distilled water, used to make these solutions, was checked for CO2 blanks for analysis on the chromatograph. Author

N83-21748# Delaware Univ., Newark. Sea Grant Coll. Program.
DATA FROM THE SALSX CRUISES Oceanographic Data Report, May 1978 - Jul. 1980
Charles H. Culberson, Jonathan H. Sharp, Thomas M. Church, and Bruce W. Lee Feb. 1982 60 p refs
(Grants NSF OCE-76-82571; NSF OCE-77-20779)
(PB83-117085; DEL-SG-05-82; NOAA-82083105; Oceanographic-Data-Report-2) Avail: NTIS HC A04/MF A01 CSCL 08J

This report presents chemical and physical data collected during six cruises in the Delaware River and Bay from May 1978 to July 1980. These cruises, designated Salsx, covered the entire salinity gradient in the estuary from freshwater in the river near Philadelphia to seawater at the entrance of the bay. Author (GRA)

N83-21749# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
ANALYSIS OF TROPICAL SOUTH PACIFIC TEMPERATURES FOR 1975 TO 1980
Cho-Teng Liu Jun. 1982 164 p refs
(PB83-117465; NOAA-TM-ERL-PMEL-34; NOAA-82083103) Avail: NTIS HC A08/MF A01 CSCL 08J

This report presents contoured objective analyses made between 1975 and 1980 (inclusive) of sea surface temperature measurements taken in the Pacific from the western coastline of the Americas to 150E, and from 25N to 30S. The analyses represent two-week-averaged SST fields contoured according to surface isotherms and include the time period of both the relatively weak El Nino of 1976 and the post-El Nino period, as well as the spatial demain of other climatically interesting regions of the western and central Pacific. Author (GRA)

N83-21750# Woods Hole Oceanographic Institution, Mass.
HYDROGRAPHIC STATION DATA OBTAINED IN THE EAST CHINA SEA, AUGUST 1981
R. Limeburner and R. C. Beardsley Sep. 1982 77 p refs
(Grants NA81AA-H-00008; NSF OCE-80-14941)
(PB83-118042; WHOI-82-39; NOAA-82091305) Avail: NTIS HC A05/MF A01 CSCL 08J

A hydrographic survey was made on August 1-16, 1981 on the People's Republic of China R/V Shijian to measure the regional hydrographic structure in the East China Sea near the mouth of the Chang Jiang (Yangze) River. The objectives of the hydrographic program were to document the spatial structure of the Chang Jiang discharge over the continental shelf and characterize the river's influence on the shelf water masses during a period of maximum river discharge. A summary of the hydrographic observations made during Cruise ECS81-1 on the R/V Shijian is presented in graphic form. Author (NTIS)

N83-21751# National Weather Service, Silver Spring, Md.
A MONTHLY AVERAGED CLIMATOLOGY AT SEA SURFACE TEMPERATURE
Richard W. Reynolds Jun. 1982 42 p refs
(PB83-115469; NOAA-TR-NWS-31; NOAA-82091505) Avail: NTIS HC A03/MF A01 CSCL 08J

A monthly one-degree global sea surface temperature climatology was processed from a National Climatic Center summary of surface marine reports. The summary's grid-scale noise has been eliminated from the climatology; however it still preserves much of the smaller-scale upwelling features and the strong gradients of the western boundary currents. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N83-21752 Defence Research Information Centre, Orpington (England).
AN APPROACH TO ESTIMATING THE POTENTIAL PRODUCTIVITY OF PHYTOPLANKTON BY ANALYSIS OF THE KINETICS OF FLUORESCENCE INDUCTION
J. Neveux and H. Jupin Oct. 1982 20 p refs Transl. into ENGLISH from Marine Bio., (France), v. 63, 1981 p 13-21
(DRIC-T-6730; BR85874) Copyright. Avail: Issuing Activity

The importance of the kinetics of fluorescence induction for characterization of phytoplankton activity is discussed. In vivo chlorophyll fluorescence is particularly interesting to ecologists because of various concepts associated with it. The kinetics of fluorescence in unialgal cultures and in the natural population of marine phytoplankton were studied by spectrophotofluorometry. The apparatus did not achieve satisfactory results with cell suspensions having a chlorophyll concentration less than 10 micro to the minus 1 power. A method for estimating kinetics of diluted cultures and marine phytoplankton was tested using cells collected on glass fiber filters. The method proved satisfactory for unialgal cultures in the exponential growth phase. For aged cultures, however, and natural marine phytoplankton the method proved unsuitable. The kinetics of fluorescence induction vary according to taxonomic position of the cells, light intensity of the measuring excitation beam and productiveness of the culture medium. E.A.K.

N83-21753*# Monsanto Research Corp., Dayton, Ohio.
MUTAGENIC SCREENING OF DIAMINE MONOMERS Contractor Report, 19 Feb. - 19 Dec. 1982
W. D. Ross, J. E. Noble, J. A. Gridley, J. M. Fullenkamp, M. T. Wininger, and J. A. Graham Feb. 1983 87 p refs
(Contract NAS1-16246)
(NASA-CR-166085; NAS 1.26:166085; MRC-DA-1124) Avail: NTIS HC A05/MF A01 CSCL 06C

The effects of phenyl ring coupling moieties, of isomeric amine positions relative to the coupling groups, and of insertion of other coupling groups on the mutagenic response of a series of dianilines were investigated using the Ames Salmonella assay. Generally, S-9 metabolic activation from Aroclor-induced rat liver was required for mutagenic expression. The range of mutagenicity of steric isomers of several dianiline series was also investigated. No mutagenicity was found for purified samples of o,o' and m,p' isomers of methylene dianiline (MDA) and diaminobenzophenone, while varying degrees of mutagenicity were found for other isomers. The mutagenicity of 'benzylogs' of MDA decreased as the degree of linear separation of the m,m' anilino groups by aromatic rings increased. Methylation and two-year storage increased mutagenic response in certain isomers of MDA. However, high performance liquid chromatography indicated there was no discernible change in m,p'-MDA samples aged under varied conditions over four months. Likewise, no change in mutagenicity was found. Author

N83-21754# National Research Council of Canada, Ottawa (Ontario).
INVESTIGATION OF PROMISING ALGAE (GRACILARIA VERRUCOSA (HUDS.) PAPENF.) FOR CULTIVATION IN THE FAR EAST
V. F. Makienko 1979 16 p refs Transl. into ENGLISH from Tr. Vses. Nauchno-Issled. Inst. Morsk. Ryb. Khoz. Okeanogr. (Moscow), no. 138, 1979 p 51-60
(NRC/CNR-TT-2051) Avail: NTIS HC A02/MF A01

The use of Gracilaria for the production of agar, Gracilaria found along the far eastern coast of the USSR, the distribution and biology of Gracilaria verrucosa (Huds.) Papenf., and problems involved in the experimental cultivation of Gracilaria verrucosa in the Far East are discussed. Author

N83-21755*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES IN CARDIOVASCULAR DECONDITIONING, PHASE 1 Final Report
M. N. Levy, ed. and J. M. Talbot, ed. Feb. 1983 78 p refs
(Contract NASw-3616)
(NASA-CR-170164; NAS 1.26:170164) Avail: NTIS HC A05/MF A01 CSCL 06C

Cardiovascular deconditioning research is discussed. Author

N83-21756*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES IN SPACE MOTION SICKNESS, PHASE 2 Final Report
J. M. Talbot, ed. Feb. 1983 63 p refs 2 Vol.
(Contract NASw-3616)
(NASA-CR-170165; NAS 1.26:170165) Avail: NTIS HC A04/MF A01 CSCL 06C
Space motion sickness research is reported. Author

N83-21757# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Biophysics.
BIOLOGICAL EFFECTIVENESS OF NEUTRON IRRADIATION ON ANIMALS AND MAN Ph.D. Thesis
Tore Straume Nov. 1982 222 p refs
(Contract W-7405-eng-48)
(DE83-003071; UCRL-53329) Avail: NTIS HC A11/MF A01
Neutron experiments on a highly radiosensitive in vivo system, oocytes in mice, which provide new insight into the nature of the radiosensitive targets of these important cells were discussed. Neutron data from animals and humans are integrated, and radiation protection standards for neutrons are addressed. Oocyte killing in juvenile mice by 0.43-MeV, (252)Cf fission, and 15 MeV neutrons, compared with that by (6) 0Co gamma rays, yieids unusually low neutron RBEs (relative biological effectiveness). At 0.1 rad of 0.43 MeV neutrons the RBE is only 1.8, which is in contrast with values of 100 or more reported at low doses for other endpoints. In mice just prior to birth, however, when oocytes are less radiosensitive, the neutron RBE is much higher, similar to values fo most other mammalian endpoints. The dramatic change in neutron RBE with mouse age is explained as the result of a shift from a less radiosensitive target to a much more radiosensitive one. A value for the neutron Quality Factor is estimated as 17 much lower than 100 which was suggested. It is found that 17 is not markedly different from the value of 10 which is presently in general use. DOE

N83-21758# Charles F. Kettering Research Lab., Yellow Springs, Ohio.
MODEL SYSTEMS FOR CHLOROPHYLL PHOTOCHEMISTRY: RETENTION OF FLUORESCENCE AT HIGH CHLOROPHYLL DENSITY AT A HYDROPHOBIC-HYDROPHILIC INTERFACE
G. R. Seely and V. Senthilathipan 1982 11 p refs
(Contract DE-AC02-82ER-12039)
(DE83-000350; DOE/ER-12039/T4) Avail: NTIS HC A02/MF A01
Many model systems containing chlorophyll show concentration quenching of fluorescence at quite moderate occupancies of the available phase space. A new kind of model system has been introduced, involving adsorption of chlorophyll and certain other amphiphilic substances to particles of polyethylene swollen with hydrocarbons, in which fluorescence is retained at coverages approaching a monolayer. In the example illustrated, the fluorescence lifetime is undiminished in spite of evidence for the presence of associated chlorophyll species along with the monomer. The preservation of fluorescence is probably owing to a combination of high viscosity in the swollen polyethylene phase and the presence of a surfactant to keep the chlorophyll in monomeric and well defined associated forms. DOE

N83-21759# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 17, NO. 1, JANUARY - FEBRUARY 1983
O. G. Gazenbo, ed. 4 Mar. 1983 150 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 96 p
(JPRS-83007) Avail: NTIS HC A07/MF A01
Twenty-eight articles were published with emphasis placed on aerospace physiology. Subject matter covered includes: nutrition, cardiac function, effects of weightlessness, and physical response to spaceflight. For individual titles, see N83-21760 through N83-21783.

N83-21760# Joint Publications Research Service, Arlington, Va.
ULTRASONIC DOPPLER CARDIOGRAPHY AS A METHOD OF STUDYING INFLIGHT CARDIODYNAMICS (RESULTS OF PATENT AND INFORMATION ANALYSIS) c52
V. S. Bednenko and A. N. Kozlov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 1-8 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 4-8 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01
Patent and information data on the methods of cardiac location using ultrasound Doppler cardiography, as well as on the design and development of onboard equipment to be used for medical monitoring of aircraft and spacecraft crewmembers inflight were reviewed. It is emphasized that Doppler cardiography, being a very informative, noise proof and relatively simple technique, holds high promise for operational medical monitoring. Author

N83-21761# Joint Publications Research Service, Arlington, Va.
VITAMIN LEVELS IN COSMONAUTS IN PREFLIGHT TRAINING PERIOD c52
M. S. Belakovskiy, N. D. Radchenko, N. G. Bogdanov, and V. B. Spirichev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 9-12 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 8-10 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01
Measurement of vitamin supply of cosmonauts during their intensive training a month preflight showed moderate deficiency of thiamine, riboflavine, pyridoxine, nicotinamide and ascorbic acid. A regular uptake of the vitamin complex for 2 weeks optimized significantly vitamin metabolism. Author

N83-21762# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM SPACEFLIGHTS ON HUMAN AMINO ACID METABOLISM c52
A. S. Ushakov, T. F. Vlasova, Ye. B. Miroshnikova, V. M. Mikhaylov, and Ye. N. Biryukov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 13-18 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 10-15 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01
The amino acid composition of the plasma and serum of Salyut 6 crewmembers who performed flights of different duration was investigated. The parameter was found to vary depending on the flight time and use of different countermeasures. The 75 and 185 day cosmonauts who did not exercise in a full measure showed a decrease in the amino acid pool typical of emergency situations. The 96, 140 and 175 day crewmembers who exercised as prescribed exhibited the lack of changes in the total content of amino acids and variations in the content of individual amino acids. The results of the study of the amino acid composition can be applied to the evaluation of inflight countermeasures, e.g., exercises, and to the development of rehabilitation measures postflight. Author

N83-21763# Joint Publications Research Service, Arlington, Va.
FREE AMINO ACIDS IN BLOOD OF SALYUT-5 CREW BEFORE AND AFTER 21-DAY MISSION (SECOND EXPEDITION) c52
I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17. No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 19-43 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 15-20 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01
Measurements of free amino acids in the plasma of the Salyut 5 crewmembers (the second expedition) before and after their 21 day spaceflight were determined. The measurements were performed in a Hitachi KLA-3B automatic amino acid analyzer. The changes in amino acid metabolism were associated with the

chemical composition of the space diet, actual food intake and spaceflight effects. The conclusion is made that the dietary content of cystine and methionine, as well as phenylalanine, tyrosine, glycine, glutamic acid and serine should be increased. No signs of hepatic or renal dysfunction were detected. It is recommended to control strictly food consumption inflight. Author

N83-21764# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF PHASE STRUCTURE OF CARDIAC CYCLE DURING LBNP TESTS IN LONG-TERM (140-185 DAY) SPACE-FLIGHTS c52
A. D. Yegorov and A. P. Polyakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 44-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 33-37 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Before and during prolonged space flights changes of systolic time intervals in response to lower body negative pressure (LBNP) tests were qualitatively similar and corresponded to the syndrome of myocardial hypodynamics due to insufficient venous return. However, the level of the changes in systolic time intervals seen in flight may be attributed to larger blood shifts to the abdomen and legs. Author

N83-21765# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION IN WATER AS A WEIGHTLESSNESS MODEL ON LUNG CLOSING VOLUMES c52
M. A. Tikhonov, A. V. Kondakov, N. M. Asyamolova, and M. Yu. Volkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 50-61 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 37-40 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The effect of 7 day water immersion combined at night with head down (6 deg) tilting on the volumes of lung expiratory closing was examined in 6 healthy male test subjects aged 26 to 35. During immersion they showed, along with a stable reduction of the lung vital and functional residual capacity (by 4.2 and 14.8%, respectively), an increase in the fraction parameters of the expiratory closing volumes. The increase in the closing volume (up to 40%) ($P < 0.05$) was particularly distinct in immersion day 2. Subsequent changes indicated gradual recovery of the closing volumes and a decline in regional nonuniformity of lung ventilation. The time course variations in the closing volumes may be attributed to an increase in the intrapulmonary blood volume at the early stage of adaptation to immersion and to a decrease in the nonuniformity of the ventilation perfusion ratios. Author

N83-21766# Joint Publications Research Service, Arlington, Va.
EXERCISE TOLERANCE FOLLOWING WATER IMMERSION c52
Ye. B. Shulzhenko, K. I. Gogolev, and S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan.-Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 55-60 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan.-Feb. 1983 p 40-45 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Before and after 24 hour water immersion test subjects performed a submaximal workload on a bicycle ergometer. Changes in their hematocrit, circulating plasma volume and fluid balance were compared with those during immersion. As a result, the test subjects were subdivided into two groups. For one group the workload was very hard; adaptation to immersion was accompanied by significant renal losses of fluid from the intra- and extravascular space. The bicycle ergometry test after immersion demonstrated a decrease of exercise tolerance combined with circulatory disorders. The other group showed a higher exercise tolerance; after immersion exercise tolerance remained high at the expense of the reserves that maintained optimal blood supply to the working muscles. Author

N83-21767# Joint Publications Research Service, Arlington, Va.
BLOOD COAGULATION PLASMA FACTORS AND CHANGE IN FIBRINOLYSIS DURING NEUTRAL TEMPERATURE WATER IMMERSION IN SUBJECTS WITH BORDERLINE HYPERTEN-SION c52
V. N. Orlov, L. L. Kirichenko, and M. A. Yunusov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 62-65 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 45-48 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The effect of 7 day dry immersion on the hemocoagulation system of male test subjects, aged 45 to 55, was examined. The experiments were carried out on 15 volunteers, 11 of whom had boundary arterial hypertension (BAH) (according to the WHO classification) and 4 were healthy controls. The data obtained (thromboelastograms and coagulograms) show that dry immersion induces hypercoagulopathic changes in the hemocoagulation system. The BAH patients have displayed a more marked fibrinolysis depression, indicating a decline of their reserve-adaptive capabilities. Author

N83-21768# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMIC PARAMETERS DURING EXPOSURE TO CONTINUOUSLY INCREASING ACCELERATIONS c52
D. Yu. Arkhangelskiy and L. S. Plakhotnyuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 66-71 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 48-52 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The effect of acceleration on central hemodynamics was investigated in centrifugation experiments. Also examined was the protective effect of muscle tension, anti G suit, and of an altered acceleration vector. It was demonstrated that visual disorders were caused by a decrease in cardiac output. The countermeasures diminished the rate with which cardiac output declined due to the higher values of stroke volume that were produced by the anti G suit and a changed body position. Arbitrary muscle tension ensured the effect only as a result of increased heart rate. Author

N83-21769# Joint Publications Research Service, Arlington, Va.
RAT REACTIONS TO IMMOBILIZATION STRESS FOLLOWING SPACEFLIGHT
L. V. Serova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 72-78 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 52-57 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The study of male Wistar rats flown on the biosatellite Cosmos 1129 showed that 7 to 10 hours after recovery they developed a distinct stress reaction of blood cell elements (increased neutrophil and decreased lymphocyte counts) and the thymus (decreased thymocyte count). Despite this, the level of their reaction (as a percentage of the preflight values) to additional immobilization stresses was similar to that of controls. As a result, by the end of immobilization tests deviations from the physiological norm in the flown animals were greater and their reserve capabilities were lower than in the controls. Author

N83-21770# Joint Publications Research Service, Arlington, Va.
ACTIVITY OF GLYCOGENOLYTIC ENZYMES IN RAT BONES AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
I. A. Popova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 79-82 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, 1983 p 57-60 (For

primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

In order to study the effect of weightlessness on metabolic processes in the bone organic matrix, alpha-amylase and aldolase activities in the ulnar bone of rats flown on Cosmos 1129 were measured. The activity of alpha-amylase and especially of aldolase was increased 6 to 10 hours after flight. The enzymic changes were the greatest in the animals exposed to weightlessness. The postflight exposure of the rats of the three experimental groups to immobilization produced different changes in the activity of the glycogen splitting enzymes: it was either stimulated or inhibited. The findings suggest that the enzymes involved in glycogen splitting in the bone organic matrix of rats flown for 18.5 days probably aim at eliminating the adverse effects of weightlessness. Author

N83-21771# Joint Publications Research Service, Arlington, Va.
ORGANIC ACID PRODUCTION AND CARBONATE CONTENT OF RAT BONES AFTER SPACEFLIGHT
A. A. Prokhonchukov, K. S. Desyatnichenko, and L. S. Kuznetsov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 83-87 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 60-62 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The content of citric, pyruvic and lactic acids in bones of 30 rats flown on Cosmos 1129 was measured. Postflight the content of citric and pyruvic acids decreased and that of lactic acid increased. During readaptation the content of the acids tended to return to normal but never reached the vivarium level. The mechanism of these changes is discussed. Author

N83-21772# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM HYPOKINESIA ON THYROID C CELLS **c52**
G. I. Plakhuta-Plakutina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 88-92 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 63-66 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The state of C-cells of the thyroid gland of Wistar rats during prolonged (30-165 days) hypokinesia was examined. A gradual decline in the function of C-cells during hypokinesia and its return to normal after 2 month readaptation was found on histology and morphology. The decline was most distinct by hypokinesia day 90 when a decrease in the number and size of nuclei, prevalance of small cells with densely packed granules in the cytoplasm occurred. The decline in the function of C-cells during hypokinesia may be one of the factors leading to increased calcium elimination from bones. The state of C-cells in animals exposed to weightlessness and hypokinesia is compared. E.A.K.

N83-21773# Joint Publications Research Service, Arlington, Va.
COMPLEMENT AND HETEROPHIL ANTIBODY LEVELS IN MONKEYS DURING ANTIORTHOSTATIC HYPOKINESIA
A. A. Ivanov, V. N. Shvets, and M. I. Boyko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 93-95 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v 17, no. 1, Jan. - Feb. 1983 p 66-67 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Sexually immature primates Macaca mulatta exposed to head down tilt and clinostating hypokinesia showed an increase in the complementary activity of serum and a decrease of heterophil antibodies. An increase in the complement content reflects an adaptive reaction to head down tilt and a decrease in heterophil antibodies indicates an inhibition of antibody forming cells (B--lymphocytes). E.A.K.

N83-21774# Joint Publications Research Service, Arlington, Va.
TRICARBOXYLIC ACID CYCLE OXIDATIVE ENZYME ACTIVITY IN LIVER OF HYPOKINETIC RATS
Yu. A. Ganin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 96-101 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 67-71 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The activity of oxidative enzymes of the Krebs cycle was examined in white rats during hypokinesia. On hypokinesia day 7 the cytosol activity of NAD dependent isocitrate dehydrogenase (ICDH) increased and that of malic enzyme decreased. On hypokinesia days 30 and 45 the activity of succinate dehydrogenase (SDH) and alfa-ketoglutarate dehydrogenase (alfa-KGDH) decreased, that of cytoplasmatic malate dehydrogenases (MDH) slightly increased, and that of NADP ICDH declined. On hypokinesia day 60 the total activity of mitochondrial dehydrogenases reduced due to a low protein content of the mitochondrial fraction, whereas the specific activity either remained unchanged (ICDH, NAD, MDH, alfa-KGDH) or increased (SDH, NADP MDH). On recovery day 25 only the activity of mitochondrial NAD dependent malate and isocitrate dehydrogenases returned to normal. E.A.K.

N83-21775# Joint Publications Research Service, Arlington, Va.
EXCRETION OF EPINEPHRINE AND NOREPINEPHRINE IN URINE IN PRESENCE OF PRESSURE-CHAMBER HYPOXIA IN MAN **c52**
I. P. Yakovleva, I. S. Balakhovskiy, V. N. Polyakov, V. K. Stepanov, and M. V. Dvornikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 102-107 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 71-75 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The effect of altitude chamber hypoxia of different intensity and duration on epinephrine and norepinephrine excretion was investigated. The hypoxia tolerance as a function of catecholamine excretion was also examined. Subjects were kept for a short time at altitudes of 5000 and 6500-7000 m and at 3500-4500 m for 24 hours. The subjects with high hypoxia tolerance showed an increased and those with low tolerance a decreased epinephrine excretion. The epinephrine excretion did not increase with the intensity and duration of the hypoxia effect. Variations in the norepinephrine excretion were insignificant in all tests. E.A.K.

N83-21776# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF PROCESS OF DECOMPOSITION OF WHEAT STRAW UNDER ARTIFICIAL CONDITIONS **c44**
Ye. A. Deshevaya, I. V. Kryuchkova, Yu. I. Shaydorov, and V. V. Popov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 108-113 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 75-79 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Wheat straw degradation under artificial conditions was studied. During the 28 day study dry matter losses were 26%. Dissolved organic substances were accumulated during the first 4 days and remained practically unaltered thereon. Minerals were dissolved during the first 2 days. The degradation occurred with a distinct periodicity reaching maximum on days 2 to 4 and 14 to 16 and was associated with a change in the predominant microorganisms. The intensity of microbial development and carbon dioxide production during degradation was linearly correlated. The growth of coleoptiles was inhibited by wheat degradation products due to phenylcarbonic acid. As the degradation continued, the structure of dissolved organic substances became more complicated and the condensation of aromatic nuclei increased. E.A.K.

N83-21777# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODELS OF SOME EXOBIOLOGICAL SITUATIONS
V. V. Verigo and T. F. Ponomareva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983

(JPRS-83007) 4 Mar. 1983 p 114-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 79-81 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Quarantine and sterilization requirements of spaceflights and the possibility of coexistence of terrestrial and aboriginal forms of life was explored. It is found that if the trophic chain with the terrestrial form acting as a consumer evolves both forms may coexist. Spatial distribution and diffusion suggests wave like processes similar to the distribution of autocatalytic reactions in chemical kinetics. E.A.K.

N83-21778# Joint Publications Research Service, Arlington, Va.
DETERMINATION AND CLINICAL ASSESSMENT OF PHYSICAL WORK CAPACITY OF FLIGHT PERSONNEL c54
V. M. Kondrakov, V. I. Koledenok, and L. I. Arsenyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 119-123 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 82-84 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The work capacity of 375 aircraft crewmembers, aged 20 to 49 doing submaximal exercises was investigated. The work capacity declined slightly with age. Factors which most frequently cause its decrease were identified in healthy and diseased people and methods of its measurement were refined. It was shown that the work load, chronotropic reserve index and cardiac index may give indirect evidence of the coronary blood flow rate, and the inotropic reserve index of the cardiac contractile function. Determination of work capacity of the flight personnel allows improvement of medical supervision, detect cardiovascular abnormalities at an early stage and substantiates expertise conclusions. E.A.K.

N83-21779# Joint Publications Research Service, Arlington, Va.
DEVICE FOR ACTIVE AND PASSIVE ORTHOSTATIC TESTS UNDER LABORATORY AND FIELD CONDITIONS c54
V. A. Dartsmeliya and G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 124-126 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 85-86 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

A system of immobilization on a turntable based on a parachute suspension, which was developed to conduct passive orthostatic tests is described. The active orthostatic test which is used for a long time in clinical practice for functional assessment of the cardiovascular system is discussed. Orthostatic circulatory insufficiency is the most consistently demonstrable consequence of man's exposure to weightlessness or conditions simulating the physiological effects of weightlessness. E.A.K.

N83-21780# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROLONGED HYPOKINESIA ON MINERALIZATION OF HUMAN CALCANEUS c52
Yu. Yu. Osipov and V. S. Shashkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 127-131 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 86-88 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The effect of long term hypokinesia and physical exercises on mineralization of human os calcis was investigated. The problem of demineralization of bones in weightlessness and with restricted motor activity continues to draw much attention on the part of researchers. Data are indicative of appreciable decrease in bone mineralization, whereas demineralization is not noted in others (4-5). E.A.K.

N83-21781# Joint Publications Research Service, Arlington, Va.
CATECHOLAMINE CONTENT OF ISOLATED RAT HYPOTHALAMUS NUCLEI AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. Kvetnansky, Yu. Chulman, and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 132-135 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 89-90 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

Long term spaceflight effects on neuroendocrine reactions and changes in catecholamine (CA) metabolism in the hypothalamus were investigated. The CA levels in different hypothalamic nuclei, aboard a biosatellite were studied. The hypothalamus, which is the main mediator between the central nervous (CNS) and endocrine systems, is richly innervated with catecholaminergic fibers, and contains relatively large amounts of noradrenalinergic, dopaminergic and adrenalinergic fibers. The presence of CA in the rat hypothalamus, as well as their exact location in its nuclei, was demonstrated by biochemical techniques. One of the important functions of CA in the hypothalamus is its participation in regulating liberin or hormone secretion and, in regulating the function of virtually the entire endocrine system. E.A.K.

N83-21782# Joint Publications Research Service, Arlington, Va.
EFFECT OF ACETAZOLAMIDE ON CATECHOLAMINE EXCRETION IN THE PRESENCE OF ALTITUDE HYPOXIA (4.5 km) c52
I. P. Yakovleva, I. S. Balakhovskiy, V. B. Malkin, and N. F. Landukhova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 136-138 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 91-92 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The role of catecholamine reactions in endurance of oxygen deficiency which can give prospects of developing antihypoxia therapy is discussed. Extreme degrees of hypoxia in animals cause release of epinephrine (E) and norepinephrine (NE) into blood. It is not clear, however, what role is played by hypoxia itself and the inevitable concomitant disturbances in acid base equilibrium. The effect of hypercapnia on catecholamine (CA) excretion was studied. The effect of hypocapnic and normocapnic hypoxia was compared. It was found that overall excretion of E and NE increased drastically only in the latter case. Acetazolamide is capable of inhibiting the enzyme, carbonate dehydratase (carboanhydrase), so that carbon dioxide is retained, and this causes less hypocapnia and related disturbances of acid base equilibrium. E.A.K.

N83-21783# Joint Publications Research Service, Arlington, Va.
EFFECT OF PHARMACOLOGICAL AGENTS ON FLUID-ELECTROLYTE METABOLISM AND HUMAN RENAL FUNCTION DURING ANTIORTHOSTATIC HYPOKINESIA c52
V. B. Noskov and V. V. Sabayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 139-141 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 92-93 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

The theoretical feasibility to correct pharmacologically the adverse effect of weightlessness on man is demonstrated. Implementation of preventive measures at the earliest stages of spaceflights, questions of pharmacological support of spacecraft crews are discussed. Pharmacological preventive agents was investigated. The effects of drugs referable to different groups of chemical compounds and combinations thereof on fluid electrolyte metabolism and renal function in healthy man, since typical changes develop in fluid and electrolyte metabolism in weightlessness and with factors that simulate its effects is assessed. E.A.K.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N83-21784* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 242, FEBRUARY 1983
Feb. 1983 82 p
(NASA-SP-7011(242); NAS 1.21:7011(242)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 299 reports, articles and other documents introduced into the NASA scientific and technical information system in January 1983. Author

N83-21785* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION BEAM SPUTTER-ETCHED VENTRICULAR CATHETER FOR HYDROCEPHALUS SHUNT Patent
Bruce A. Banks, inventor (to NASA) Issued 10 Jun. 1983 7 p Filed 10 Jun. 1981 Supersedes N81-27786 (19 - 18, p 2531)
(NASA-Case-LEW-13107-1; US-Patent-4,377,169; US-Patent-Appl-SN-272407; US-Patent-Class-604-8; US-Patent-Class-604-280) Avail: US Patent and Trademark Office CSCL 06C

A cerebrospinal fluid shunt in the form of a ventricular catheter for controlling the condition of hydrocephalus by relieving the excessive cerebrospinal fluid pressure is described. A method for fabrication of the catheter and shunting the cerebral fluid from the cerebral ventricles to other areas of the body is also considered. Shunt flow failure occurs if the ventricle collapse due to improper valve function causing overdrainage. The ventricular catheter comprises a multiplicity of inlet microtubules. Each microtubule has both a large openings at its inlet end and a multiplicity of microscopic openings along its lateral surfaces.
Official Gazette of the U.S. Patent and Trademark Office

N83-21786# Gewerkschaft Kermachemie, Siershahn (West Germany).
REDUCTION OF HEALTH HAZARDS BY REPLACEMENT OF ABESTOS IN CHEMICALLY RESISTANT STRUCTURAL COMPONENTS Final Report, Nov. 1980
Eckhard Schacht and Karl-Josef Schwickart Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 53 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-030; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11

Tests were carried out to replace asbestos. It was attempted to adapt to a large extent the properties of the asbestos-free moulding material regarding processing, physical properties, and chemical resistivity to those of the asbestos-reinforced compound. After tests of raw materials and test mixtures on the laboratory and technical scale, five basic recipes were elaborated and the suitability of such compounds in the manufacture of experimental structural components was investigated. It was demonstrated that especially materials with combinations of carbon fibers, carbon black, and coke grit as well as special glass fibers with mica, as far as their qualities are concerned, come close to the asbestos containing materials but that they have considerably higher costs of raw material and of mechanical processing. The proof of the suitability in practice was started for some typical cases of application by the manufacture of structural members from asbestos-free materials. Author

N83-21787# Siemens A.G., Munich (West Germany). Forschungslab.
THERMOPLASTIC DEVELOPMENT OF ELECTRORADIOGRAPHIC CHARGE PATTERNS FOR MEDICAL APPLICATIONS Final Report, Aug. 1980
Peter Clemens, Gerd Goldmann, Eckhard Storck, and Ulrich Wolff Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 61 p refs In GERMAN: ENGLISH summary Sponsored by Bundesministerium fuer Forshung un Technologie
(BMFT-FB-T-82-002; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany GM 13

A direct development technique with high sensitivity for electroradiographic charge patterns to obtain a relief pattern on a thermoplastic material was investigated. Ionography and Xeroradiography using toner development are much less sensitive than x-ray recording on screen film systems. For the ionography as well as for the xeroradiography new carrier frequency techniques were developed which permit the screening of the signal charge due to the X-ray without screening the biascharge. Combining suitable plastic and elastic components the thermal and electric properties of the thermoplastics were adapted to the special requirements of electroradiography. It is concluded that this technique is not suitable for practical applications. E.A.K.

N83-21788*# National Aeronautics and Space Administration, Washington, D. C. Office of Space Science and Applications.
STS-5 POSTFLIGHT MEDICAL OPERATIONS REPORT
23 Mar. 1983 18 p refs
(NASA-TM-85281; E-989-82-05; NAS 1.15:85281) Avail: NTIS HC A02/MF A01 CSCL 06P

Space Transportation System medical objectives, crew health assessment and support activities, environmental medicine, and life sciences-related test operations, are discussed. N.W.

N83-21789# Johns Hopkins Univ., Baltimore, Md. Dept. of Chemistry.
QUANTUM CHEMICAL AND THEORETICAL INVESTIGATIONS OF TOXICITY Annual Technical Progress Report, 16 Nov. 1981 - 15 Nov. 1982
Joyce J. Kaufman and Walter S. Koski 22 Nov. 1982 68 p refs (Contract N00014-81-K-0007)
(AD-A122812; AR-2) Avail: NTIS HC A04/MF A01 CSCL 15/2

The feasibility of quantum chemical and other theoretical techniques in the correlation and prediction of toxicity of a specific class of compounds was demonstrated. The family compounds chosen were the organophosphorus pesticides and nerve gas family, since these both have relatively clear cut one dose acute lethal toxicity, LD50, and ED50 for the triggering event, inhibition of acetylcholinesterase, to serve as well defined and points. Particular quantum chemical requisites which are related to and predictive of the toxic effects of these molecules were identified.
GRA

N83-21790# Naval Medical Research Inst., Bethesda, Md.
COMPUTER-ASSISTED SYSTEM FOR DIGITAL DATA ACQUISITION OF RESPIRATORY FUNCTION TESTS AND ANALYSIS OF ISOVOLUME RESISTANCE Final Medical Research Progress Report
R. P. Layton, P. W. Catron, and S. H. Prince Apr. 1982 80 p
(AD-A122551; NMRI-82-2) Avail: NTIS HC A05/MF A01 CSCL 06/5

Computerized methods for collection and transfer of data from pulmonary function tests and for analysis of isovolume resistance data are described. Detailed user instructions are provided for the programs, which are written for a desktop computer. Author (GRA)

N83-21791# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
RESEARCH PROGRAM REVIEW OF AIRCREW PHYSIOLOGY
Gloria Twine Chisum, ed., Phyllis E. Morway, ed., and Hyman Rosenwasser, ed. (Naval Air Systems Command) Jun. 1982 104 p refs
(RR04101001)
(AD-A122076; NADC-82232-60) Avail: NTIS HC A06/MF A01 CSCL 06/19

Presented is an overview of the helmet mounted display; progress in real time monitoring of the visual evoked potential;

visual and auditory localization; detection of retinal ischemia prior to blackout by electrical evoked cortical response; intracortical interactions for orientation contrast; chemical aspects of visual transduction; and spectrally selective adaptation effects. R.J.F.

N83-21792# Ohio State Univ., Columbus. Dept. of Psychology.
OPTICAL TRANSFORMATION DURING MOVEMENT: REVIEW OF THE OPTICAL CONCOMITANTS OF EGOMOTION Final Report, 1 Mar - 30 Nov. 1981
Rik Warren Oct. 1982 80 p refs
(Grant AF-AFOSR-0108-81)
(AD-A122275; AFOSR-82-1028TR) Avail: NTIS HC A05/MF A01 CSCL 06/16

The primary goals of this report are to make the formal mathematical descriptions of the optical concomitants of rectilinear self-motion through the environment more useful by consolidating, clarifying, and extending them. The report includes: (1) a critical review of the literature on the optical bases for the perception of rectilinear self-motion; (2) an outline of a comprehensive framework for the study of self-motion perception based on J. J. Gibson's ecological approach; and (3) an introduction to a unified mathematical treatment of the global optical effects of rectilinear self-motion. A careful distinction is maintained between geometrical facts and perceptual or psychological aspects of self-motion. The report is written in a tutorial style. Author (GRA)

N83-21793# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BIOMECHANICS OF ATLANTO-OCCIPITAL AND ATLANTO-AXIAL JOINT INJURIES
A. A. Rumyantseva and V. I. Yevseyev 12 Nov. 1982 15 p refs Transl. into ENGLISH from Chirurgia Narzadow Ruchu i Ortopedia Polska (Poland), v. 43, no. 2, 1978 p 97-104
(AD-A122780; FTD-ID(RS)T-1316-82) Avail: NTIS HC A02/MF A01 CSCL 06/19

Using mathematical modeling, the biomechanics of two upper cervical vertebrae are discussed. On the basis of an analysis of 73 patients, conclusions are proposed for the diagnosis and therapy of changes resulting from injuries to the upper cervical segment of the spine. R.J.F.

N83-21794# Argonne National Lab., Ill.
RADIOLOGICAL AND ENVIRONMENTAL RESEARCH DIVISION, CENTER FOR HUMAN RADIOBIOLOGY Annual Report, Jul. 1980 - Jun. 1981
R. E. Rowland, A. F. Stehney, and J. Rundo Mar. 1982 252 p 2 Vol.
(Contract W-31-109-eng-38)
(DE82-013571; ANL-81-85-Pt-2; AR-12-Pt-2) Avail: NTIS HC A12/MF A01

Various topics in the fields of radiobiology and health physics are discussed. A novel approach to the problem of risk analysis for radionuclides deposited in bone is discussed. The induction of osteosarcoma by alpha particle irradiation of cells lining the bone surface is discussed. Different aspects of the metabolism and biological effects of radium and plutonium are discussed. R.J.F.

N83-21760# Joint Publications Research Service, Arlington, Va.
ULTRASONIC DOPPLER CARDIOGRAPHY AS A METHOD OF STUDYING INFLIGHT CARDIODYNAMICS (RESULTS OF PATENT AND INFORMATION ANALYSIS)
V. S. Bednenko and A. N. Kozlov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 1-8 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 4-8 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21761# Joint Publications Research Service, Arlington, Va.
VITAMIN LEVELS IN COSMONAUTS IN PREFLIGHT TRAINING PERIOD
M. S. Belakovskiy, N. D. Radchenko, N. G. Bogdanov, and V. B. Spirichev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 9-12 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 8-10 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21762# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM SPACEFLIGHTS ON HUMAN AMINO ACID METABOLISM
A. S. Ushakov, T. F. Vlasova, Ye. B. Miroshnikova, V. M. Mikhaylov, and Ye. N. Biryukov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 13-18 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 10-15 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21763# Joint Publications Research Service, Arlington, Va.
FREE AMINO ACIDS IN BLOOD OF SALYUT-5 CREW BEFORE AND AFTER 21-DAY MISSION (SECOND EXPEDITION)
I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17. No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 19-43 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 15-20 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21764# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF PHASE STRUCTURE OF CARDIAC CYCLE DURING LBNP TESTS IN LONG-TERM (140-185 DAY) SPACEFLIGHTS
A. D. Yegorov and A. P. Polyakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 44-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 33-37 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21765# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION IN WATER AS A WEIGHTLESSNESS MODEL ON LUNG CLOSING VOLUMES
M. A. Tikhonov, A. V. Kondakov, N. M. Asyamolova, and M. Yu. Volkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 50-61 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 37-40 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21766# Joint Publications Research Service, Arlington, Va.
EXERCISE TOLERANCE FOLLOWING WATER IMMERSION
Ye. B. Shulzhenko, K. I. Gogolev, and S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan.-Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 55-60 refs Transl. into ENGLISH from Kosmich. Biol. Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan.-Feb. 1983 p 40-45 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21767# Joint Publications Research Service, Arlington, Va.
BLOOD COAGULATION PLASMA FACTORS AND CHANGE IN FIBRINOLYSIS DURING NEUTRAL TEMPERATURE WATER IMMERSION IN SUBJECTS WITH BORDERLINE HYPERTENSION
V. N. Orlov, L. L. Kirichenko, and M. A. Yunusov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 62-65 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 45-48 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21768# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMIC PARAMETERS DURING EXPOSURE TO CONTINUOUSLY INCREASING ACCELERATIONS
D. Yu. Arkhangelskiy and L. S. Plakhotnyuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 66-71 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 48-52 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21772# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM HYPOKINESIA ON THYROID C CELLS
G. I. Plakhuta-Plakutina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 88-92 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 63-66 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21775# Joint Publications Research Service, Arlington, Va.
EXCRETION OF EPINEPHRINE AND NOREPINEPHRINE IN URINE IN PRESENCE OF PRESSURE-CHAMBER HYPOXIA IN MAN
I. P. Yakovleva, I. S. Balakhovskiy, V. N. Polyakov, V. K. Stepanov, and M. V. Dvornikov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 102-107 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 71-75 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21780# Joint Publications Research Service, Arlington, Va.
EFFECT OF PROLONGED HYPOKINESIA ON MINERALIZATION OF HUMAN CALCANEUS
Yu. Yu. Osipov and V. S. Shashkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 127-131 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 86-88 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21782# Joint Publications Research Service, Arlington, Va.
EFFECT OF ACETAZOLAMIDE ON CATECHOLAMINE EXCRETION IN THE PRESENCE OF ALTITUDE HYPOXIA (4.5 km)
I. P. Yakovleva, I. S. Balakhovskiy, V. B. Malkin, and N. F. Landukhova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 136-138 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 91-92 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21783# Joint Publications Research Service, Arlington, Va.
EFFECT OF PHARMACOLOGICAL AGENTS ON FLUID-ELECTROLYTE METABOLISM AND HUMAN RENAL FUNCTION DURING ANTIORTHOSTATIC HYPOKINESIA
V. B. Noskov and V. V. Sabayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 139-141 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 92-93 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N83-21795# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
STRESS, INFORMATION PROCESSING AND COPING WITH DEPTH: PROBLEMS OF INDIVIDUAL DIVERS
P. G. A. M. Jorna Jun. 1982 26 p refs
(Contract A79/KM/030)
(IZF-1982-14; TDCK-76862) Avail: NTIS HC A03/MF A01

The diver's ability to cope with the underwater situation is an important factor with respect to the diver's performance and physiological reactions. The aim of the present study was to assess a possible increase in psychological load, requiring additional coping, as a consequence of diving at greater depths during advanced diver training. Performance (Continuous Memory Task: CMT) and physiological measures (heart rate, blood pressure component, respiration) were obtained for dives at twenty meters depth and a narcotic dive at fifty meters depth. These measures were compared with control measures obtained during the basic training course involving shallow dives at about three meters. It was found that an increased depth is not necessarily accompanied by an increased psychological response, provided that the diver coped well during the shallow conditions. For divers less efficient under such conditions, performance effectiveness is reduced by an increase in depth. Such divers were characterized by a decreased blood pressure component of heart rate variability, an increased response to task load, a suppressed bradycardia and a less efficient performance level. B.W.

N83-21796# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.
AGE AND INFORMATION PROCESSING: AN APPLICATION OF STERNBERG'S ADDITIVE FACTOR METHOD
J. Moraal Jun. 1982 20 p refs
(IZF-1982-18; TDCK-76864) Avail: NTIS HC A02/MF A01

Previous research suggests the encoding stage of central information processing as the locus of differences in choice reaction time between younger and older subjects. An experiment was conducted to test whether this could be confirmed using Sternberg's Additive Factor Method. Two groups of subjects (mean ages 23 and 64) performed a four-choice reaction time task in which reaction time and movement time were the response measures. Independent variables were stimulus intensity, stimulus-response compatibility, foreperiod duration and age. Results showed additivity of the effects of the first three variables which is in line with earlier research findings. Age had a main effect and a marginal interaction with stimulus intensity. With regard to movement time the results suggest that compared with younger subjects, elderly subjects may have more problems in separating the processing of information from the execution of the response.
Author

N83-21797# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.
STIMULUS PREPROCESSING AND ENCODING OF INFORMATION: AGE-RELATED DIFFERENCES
J. Moraal Jun. 1982 11 p refs
(IZF-1982-19; TDCK-7686) Avail: NTIS HC A02/MF A01

It was investigated whether slowing down with age might selectively be localized at the input side of visual information processing. Using Sternberg's Additive Factor Method two groups of subjects (mean ages 22 and 66 years) performed a visual choice reaction task with stimulus intensity and stimulus degradation as the within-subjects independent variables, respectively affecting the preprocessing and encoding stages of information processing. Results showed that age effects did not selectively affects either one of these stages. The main age effect was not significant which may be due to the type of motor response.
Author

N83-21798# Federal Aviation Agency, Atlantic City, N.J.
PILOT PERFORMANCE MEASUREMENT: AN ANNOTATED BIBLIOGRAPHY Final Report
Jacqueline T. Rehmann Dec. 1982 62 p

(FAA Proj. 161-301-150)
(FAA-EM-81-16; FAA-CT-82-24) Avail: NTIS HC A04/MF A01

One hundred references relating to pilot performance were selected and summarized as part of the Cockpit Display of Traffic Information (CDTI) studies currently being conducted by the Federal Aviation Administration Technical Center in Atlantic City, N.J. A comprehensive search of the scientific literature was conducted using several sources, including books, scientific journals, proceedings of technical meetings, and computerized information retrieval. Specific topics covered in this annotated bibliography, as they relate to pilot performance, include behaviors, measures, and instruments for performance evaluation in actual and simulated environments, task taxonomies and modeling, physiological measurement, and automated performance measures. Author

N83-21799# Yale Univ., New Haven, Conn. School of Organization and Management.
A SET OF METHODS FOR RESEARCH ON WORK TEAMS Interim Report
J. Richard Hackman Dec. 1982 180 p refs
(Contract N00014-80-C-0555; NR Proj. 170-912)
(AD-A122123; Rept-1) Avail: NTIS HC A09/MF A01 CSCL 05/9

A set of instruments that can be used in research on the effectiveness of work teams in organizations is described. The instruments are based on an action-oriented model of group task effectiveness. They were developd as part of a research program in which multiple methods are used to assess the performance-relevant characteristics of work teams and their organizational contexts. The instruments are: (1) a guide for conducting observations of work teams in situ, (2) an interview protocol for use in obtaining group members' own assessments of their team and the surrounding organization, and (3) two questionnaires (one appropriate for group members, one for nonmembers) that assess member perceptions of the variables in the group effectiveness model. Copies of all instruments and their manuals or scoring keys are appended. GRA

N83-21800# Colorado Univ., Boulder. Inst. of Cognitive Science.
A FRAMEWORK FOR FORMING, MODIFYING, AND USING MULTIMEDIA CONCEPTS IN MEMORY. PART 1: MATHEMATICAL FORMULATION
Patricia Baggett and Andrzej Ehrenfeucht Nov. 1982 58 p refs
(Contract N00014-78-C-0433; NR Proj. 157-422)
(AD-A122580; TR-118-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/2

A theoretical framework for the structures and processes of memory is presented. The model is based on three main notions: memory, concepts, and processors. Part I puts forth the notions in mathematical terms. (Part II will give an interpretation in psychological terms. Memory is viewed as a set of locations, and locations have values. An evaluation function attaches a value to a location. The basic unit in memory is the concept. Concepts have a hierarchical structure. They are related by the relation "is a subconcept of'. At a given time, each concept has a set of locations assigned to it. The assignment is made by an allocation function. A state of memory is defined as a set of concepts, the relation 'is a subconcept of', an allocation function, and an evaluation function. Processors change the state of memory and provide interaction with the environment (input/output). Each processor operates with a limited number of concepts at a given time. The action of a processor is determined by concepts, mainly by the values of locations allocated to a given concept and by the input stimulus from the environment. For a given processor, the concepts which determine the action of the processor will be called the excutable concepts for the processor. GRA

N83-21801# Stanford Univ., Calif. Dept. of Computer Science.
LEARNING AND INDUCTIVE INFERENCE
Thomas G. Dietterich, Bob London, Kenneth Clarkson, Geoff Dromey, Paul R. Cohen, and Edward A. Feigenbaum Jul. 1982 209 p refs
(Contract MDA903-80-C-0107)
(AD-A122351; SU-STAN-CS-82-913; HPP-82-10) Avail: NTIS HC A10/MF A01 CSCL 05/10

The main results of the report are: (1) a simple model that serves to generate a taxonomy of learning systems, (2) the explication and clarification of four methods of learning single concepts, (3) some understanding of the underlying causes of the credit-assignment problem (and possible solutions), and (4) some identification of open research problems and areas that have received little attention. The report is structured as a set of articles. Seven of the articles present the main problems and issues in learning research, while the remaining fifteen articles describe particular learning systems that have been developed. GRA

N83-21802# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THE EFFECT OF AN EYE MOVEMENT RECORDER ON HEAD MOVEMENTS
A. J. Beach and M. W. Hill Jul. 1982 10 p refs
(AD-A121664; DCIEM-82-R-25) Avail: NTIS HC A02/MF A01 CSCL 05/5

The present study had two major objectives: (1) to determine whether the NAC Eye Mark system alters the normal pattern of subject head movement in a typical simulated helicopter piloting tasks; and (2) to obtain subjective evaluations from subjects while wearing the NAC eye mask concerning field of view, acuity, comfort and safety. Concerning the analysis technique, it was shown that the measurement of total movement of the subjects head could be reliably accomplished with the equipment and method used. The unmodified NAC eyepiece was found to cause significantly more head movement in IFR flight than a no mask condtion. It was also demonstrated that an NAC mask with the lower horizontal section removed and semisilvered lenses on both eyes did not differ significantly from the no mask condition in terms of head movements; in contrast, the unmodified Mark 7 mask was the preferred choice of the subjects since the eye pieces did not cause eye fatigue with the lightning conditions in the simulator. Subsequent work has shown that in actual flight conditions, the Mark 2 mask was preferred, since the increased light levels of actual flight alleviated the problem of eye fatigue. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N83-21803# Presswerke Krefeld G.m.b.H. und Co., K.G. (West Germany).
USE OF HANDLING SYSTEMS TO REDUCE MULTIPLE PHYSICAL EXERTION IN DROP FORGES Final Report, Jun. 1981
Bernd Schulze Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 27 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-032; ISSN-0171-7618) Avail: NTIS HC A03/MF A01

The implementation of flexible handling systems for the handling of forgings of small and medium weight is discussed. The performance of the system and its effect on the work environment are addressed. M.G.

N83-21804# Albany International Corp., Dedham, Mass.
RESISTANCE OF NAVY SHIPBOARD WORK SLOTHING MATERIALS TO EXTREME HEAT Final Report, 3 Dec. 1980 - 31 Jul. 1982
Meredith M. Schoppee, Judith M. Welsford, and Norman J. Abbott Natick, Mass. Navy Clothing and Textile Research Facility. Oct. 1982 176 p refs
(Contract N00140-81-C-BA83)
(AD-A122348; NCTRF-TR-148) Avail: NTIS HC A09/MF A01

CSCL 11/5

Estimates of burn injury potential of Navy work clothing materials have been made by measuring retention of tensile properties during exposure to radiant heat; resistance to ignition; heat transfer during exposure to either radiant heat or flame impingement. Seventeen outerwear fabrics were tested, including polyester, cotton (normal and FR), wool, polyester/cotton, polyester/wool, polyester/rayon, nylon/cotton and Nomex/Kevlar blends of weights ranging from 3.5 to 10.3 oz/sq yd. Four underwear fabrics, both woven and knit, made from 100% cotton and 65/35 polyester/cotton were also included, as well as various outerwear/underwear combinations. The analytical work of Alice M. Stoll and her associates was extended to obtain an estimate of burn injury potential from heat transfer data. Author (GRA)

N83-21805# Naval Coastal Systems Center, Panama City, Fla. Diving and Salvage Ship Husbandry Branch.
THE EFFECTS OF PULSATILE FLOW ON CARBON DIOXIDE ABSORPTION BY HIGH PERFORMANCE SODASORB
A. Purer, G. A. Deason, M. L. Nuckols, and R. Taylor Dec. 1982 13 p refs
(AD-A122668; AD-F200046; NCSC-TM-364-82) Avail: NTIS HC A02/MF A01 CSCL 06/11

The effects of pulsatile flow on carbon dioxide absorption by high performance Sodasorb was investigated using previously developed methods. This investigation covers both a saturated and dry carrier gas with average linear velocities from about 2 to 20 centimeters per second at a pulse rate of 20 to 110 cycles per minute. A small breathing machine was used to generate the pulsatile flow. Pulsatile flow was found to be more efficient than constant flow with a dry carrier gas. A more complex relationship was observed for a saturated carrier gas; however, the trend was for pulsatile flow to be less efficient at high linear velocities. At low linear velocities, the efficiencies of the pulsatile flow approached that of constant flow. Author (GRA)

N83-21806# BioTechnology, Inc., Falls Church, Va.
ALLOCATION OF FUNCTIONS IN MAN-MACHINE SYSTEMS: A PERSPECTIVE AND LITERATURE REVIEW
H. E. Price, R. E. Maisano, and H. P. VanCott Jun. 1982 149 p refs Sponsored in part by ORNL
(Contract W-7405-eng-26)
(DE82-016191; NUREG/CR-2623; ORNL/Sub-81/9027/1) Avail: NTIS HC A07/MF A01

This report reviews the literature relevant to allociation of functions and presents a procedure for the allocation process applicable to nuclear power plant control rooms. An historical perspective of man's relationship with technology is given as background. Methods and models that have been developed to aid the allocation process are then considered, followed by examples of real-world applications. The relationship of allocation of function to the system development process is outlined. The report then turns to the proposed procedure of the allocation process. DOE

N83-21807# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HUMAN-ENGINEERING DESIGN CONSIDERATIONS FOR CATHODE-RAY-TUBE-GENERATED DISPLAYS
William W. Banks, David I. Gertman, and Rohn J. Petersen Apr. 1982 313 p refs
(Contract DE-AC07-76ID-01570)
(DE82-015231; NUREG/CR-2496; EGG-2161) Avail: NTIS HC A14/MF A01

Relevent issues related to human performance in conjunction with the use of cathode ray tube-generated display are discussed. Twelve primary source documents were identified for human engineering content review. From these documents a set of 22 variables were selected and analyzed. Each variable is discussed in terms of its impact, relevance, and validity with regard to various standards that evolved over the past 20 years. Studies related to each standard were also identified and cited that either support or weaken a particular standard. The conclusion drawn indicate that there are areas needing further investigation before valid standards can be generated. However, there are many current standards that have ample research support to justify them as candidate standards for use by the Nuclear Regulatory Commission. Suitability of these various standards is discussed. DOE

N83-21778# Joint Publications Research Service, Arlington, Va.
DETERMINATION AND CLINICAL ASSESSMENT OF PHYSICAL WORK CAPACITY OF FLIGHT PERSONNEL
V. M. Kondrakov, V. I. Koledenok, and L. I. Arsenyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 119-123 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 82-84 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

N83-21779# Joint Publications Research Service, Arlington, Va.
DEVICE FOR ACTIVE AND PASSIVE ORTHOSTATIC TESTS UNDER LABORATORY AND FIELD CONDITIONS
V. A. Dartsmeliya and G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 17, No. 1, Jan. - Feb. 1983 (JPRS-83007) 4 Mar. 1983 p 124-126 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 17, no. 1, Jan. - Feb. 1983 p 85-86 (For primary document see N83-21759 11-51)
Avail: NTIS HC A07/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N83-21808*# National Aeronautics and Space Administration, Washington, D. C.
THE NASA COMPUTER SCIENCE RESEARCH PROGRAM PLAN
Mar. 1983 100 p refs
(NASA-TM-85631; NAS 1.15:85631) Avail: NTIS HC A05/MF A01 CSCL 09B

A taxonomy of computer science is included, one state of the art of each of the major computer science categories is summarized. A functional breakdown of NASA programs under Aeronautics R and D, space R and T, and institutional support is also included. These areas were assessed against the computer science categories. Concurrent processing, highly reliable computing, and information management are identified. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N83-21809# National Center of Scientific and Technological Information, Tel Aviv (Israel).
DEVELOPMENT OF MINICOMPUTERS IN AN ENVIRONMENT OF SCIENTIFIC AND TECHNOLOGICAL INFORMATION CEN-

TERS (DOMESTIC): A MINICOMPUTER-BASED INFORMATION HANDLING SOFTWARE PACKAGE Final Report, Dec. 1981

Yaacov Omer and Hans Eberhard Seelbach (KTS Informations-Systeme GmbH) Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 160 p refs Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-ID-82-005; ISSN-0170-8996) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,50

DOMESTIC (Development of Minicomputers in an Environment of Scientific and Technological Information Centers) is a joint Israeli-German project for the application of minicomputers in information storage and retrieval. The DOMESTIC software package includes functions for online creation and updating of inhouse databases; assimilation of external databases; setting up, running and reformulating online database searches; viewing search results; printing the output in selected formats; and various tasks associated with the acquisition, cataloging and circulation phases of information center activities. The DOMESTIC system comprises at present programs for database management, online input of documents and thesaurus creation and maintenance, search and interactive dialog modules, a print generator, a library management module and various batach input modules. Author (ESA)

N83-21810# British Library Lending Div., Boston Spa (England).

THE APPLICATION OF MICROPROCESSORS IN RADIATION PROTECTION MEASUREMENTS, PROGRESS REPORT

D. Zappe, G. Rosel, and C. Melde 1982 9 p refs Transl. into ENGLISH from Kernenergie (West Germany), v. 25, no. 8, 1982 9 p Presented at the 14th Winter School on Radiation Protection Phys., Gaussig, West Germany, 1-5 Mar. 1982

(BLL-WH-535) Avail: British Library Lending Div., Boston Spa, Engl.

Microprocessor characteristics, applications for microprocessors in radiation protection measurement technology are addressed. Author

N83-21811# Harvard Univ., Cambridge, Mass. Computation Lab.

REAL-TIME SYNCHRONIZATION OF INTERPROCESS COMMUNICATIONS

John H. Reif and Paul G. Spirakis Jun. 1982 51 p refs

(Contract N00014-80-C-0674; Grant NSF MCS-79-21024)

(AD-A122541; TR-25-82) Avail: NTIS HC A04/MF A01 CSCL 09/2

This paper considers a fixed (possibly infinite) set of distributed asynchronous processes which at various times are willing to communicate with each other. We describe probabilistic distributed algorithms for synchronizing processes so that they can handshake at will. The means of synchronization are boolean flag variables, each of which can be written by only one process and read by at most one other process. The use of flag variables seems as to require the fewest assumptions possible without considering specific systems. A process is considered to be tame over a time interval delta if its speed varies within certain arbitrarily fixed nonzero bounds. We show our synchronization algorithms have real time response: If a pair of processes are mutually willing to communicate within a time interval delta of length at least a given constant and the pair are tame on delta, then they establish communication within delta with high likelihood (for the worst case behavior of the system and the expected time for establishment of communication is also constant. We feel the term real time is merited, for the actual time needed for establishment of communication is upper bounded by a constant with overwhelming probability; furthermore, violations of this property occur with vanishingly low likelihood. We have very few assumptions: (1) Tameness is required of a process only during the interval it is willing to communicate; and (2) the processes may be willing to communicate with a time varying set of processes which are only bounded in number. GRA

N83-21812# Sandia Labs., Albuquerque, N. Mex.

ORGANIZATION 2400 COMPUTER AIDED DESIGN NETWORK DISPATCHER. PHASE 1: DESCRIPTION

W. C. Burd, R. R. Lozano, and A. L. Yates Mar. 1982 43 p refs (Contract DE-AC04-76DP-00789)

(DE82-014529; SAND-82-0473) Avail: NTIS HC A03/MF A01

The Sandia Organization 2400 Computer Aided Design Network Dispatcher is described as currently implemented. An overview of its structure, design goals, CADS applications and error processing is presented. Plans for extending the Dispatcher's current capabilities are also described. DOE

N83-21813# Los Alamos Scientific Lab., N. Mex.

DISKLESS LSI-11 SYSTEMS

W. Ford and D. G. Shirk 1982 5 p refs Presented at Spring DECUS Symp., Atlanta, 10 May 1982

(Contract W-7405-eng-36)

(DE82-014048; LA-UR-82-1133; CONF-820515-5) Avail: NTIS (US Sales Only); HC A02/MF A01; DOE Depository Libraries

Programs for dedicated LSI-11 based systems can easily be stored in RAM instead of floppy disks, yet execute the same as disk-stored programs. Two sample systems are described. DOE

N83-21814# Los Alamos Scientific Lab., N. Mex.

INTEGRATION OF MICROCOMPUTERS INTO A NETWORK

D. C. Sparks 1982 5 p refs Presented at Spring DECUS Symp., Atlanta, 10 May 1982

(Contract W-7405-eng-36)

Avail: NTIS HC A02/MF A01

Discussed is the evolution of large, extremely complex Integrated Computing Network at the Los Alamos National Laboratory and the integration microcomputers as computer-based work stations into that network. Of key concern is the specification of a work station that is not directed toward a particlar manufacturer, but rather toward software tools that can be implemented readily on equipment from various manufacturers. DOE

N83-21815# California Univ., Livermore. Lawrence Livermore Lab. Chemical Science and Engineering Div.

COMMUNICATING BETWEEN THE APPLE AND THE WANG

George W. Barton, Jr. and Robert Downey 26 Oct. 1982 24 p refs

(Contract W-7405-eng-48)

(DE83-002459) Avail: NTIS HC A02/MF A01

This manual covers what the beginner needs to know in order to transfer files between an Apple's Microcomputer and a Wang's OIS Word Processor. We have also tried to indicate where the experienced user might want to look for additional details. We cover the use of Apple Writer II, VisiTerm, VisiCalc, and EasyWriter Professional. For us, the two most useful connections are from Applewriter to Wang and from Visicalc to Wang. From Wang to Apple Writer via Visiterm may have some value. Files can be transferred by VisiTerm to Wang, but they arrive with RETURNS in the middle of words, which have to be edited out, so we do not recommend it. We describe how to go from EasyWriter to Wang, but we do not know how to go from Wang to EasyWriter. We see no reason to go from Wang to VisiCalc, so we haven't thought about it. All instructions are given for a typical configuration of the Apple, namely the one on which this manual was composed. It is detailed in the section on hardware and software. DOE

N83-21816# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

NONLINEAR LEAST SQUARES FITTING ON A MINICOMPUTER: METHOD AND EXAMPLE

Ronald L. Schwiesow May 1982 19 p refs

(PB83-112482; NOAA-TR-ERL-421; WPL-57; NOAA-82091504) Avail: NTIS HC A02/MF A01 CSCL 09B

A method for fitting an analytic expression to date when the expression is not linear in the unknown parameters is outlined. Elements of the method include linearization of the expression, iterative improvement of the fit, and solution, based on the Gauss-Seidel approach, of a set of equations. A realization of the

method, which does not require double precision is given in FORTRAN. The method and code are applied to a specific problem of fitting a spectrum analyzer baseline with the expectation that readers can modify the program for their particular data reduction problems. DOE

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N83-21817 Royal Signals and Radar Establishment, Malvern (England).
CURT: THE COMMAND INTERPRETER LANGUAGE FOR FLEX
I. F. Currie and J. M. Foster Sep. 1982 32 p refs
(RSRE-3522; BR86039) Copyright. Avail: Issuing Activity

Curt is an interactive command language for the Flex computer system. Since one feature of Flex is its treatment of procedures as first class data objects, the creation and calling of procedures is the most important part of Curt. In addition, Curt handles a wide spectrum of types of values in as uniform a manner as possible and is a very flexible tool for the construction of programs. The language modes, syntax, and semantics are described.Author

N83-21818# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
PHOENICS COMPUTER CODE SEMINAR
D. Brian Spalding Nov. 1982 118 p refs Presented in London, Spring 1982
(CFD/82/5) Avail: NTIS HC A06/MF A01

The computer code system, PHOENICS, is discussed which is capable of simulating a large number of fluid mechanics, heat and mass transfer, and chemical reaction processes. Program and subroutine structure, mathematical and physical basis, and use of the system are addressed. For individual titles, see N83-21819 through N83-21822.

N83-21819# Imperial Coll. of Science and Technology, London (England).
INTRODUCTION TO PHOENICS
D. Brian Spalding *In its* PHOENICS Computer code Sem. Nov. 1982 p 1-14 refs (For primary document see N83-21818 11-61)
Avail: NTIS HC A06/MF A01

A general description of the PHOENICS code system is presented. It is a general purpose computer code system for simulating phenomena of fluid mechanics, heat and mass transfer, and combustion and other chemical reactions. The structural principle of PHOENICS is characterized by a central core of subroutines called EARTH, to which users have no direct access, and auxiliary programs, refered to as 'satellites' and 'ground stations', which are user-accessible. The physical principles embodied in the program system, the geometrical capabilities, and the numberical solution procedure are described. Code architecture, input and output, core memory use, and access are also addressed. M.G.

N83-21820# Imperial Coll. of Science and Technology, London (England).
THE MATHEMATICAL BASIS OF PHOENICS
D. Brian Spalding *In its* PHOENICS Computer Code Seminar Nov. 1982 p 15-54 (For primary document see N83-21818 11-61)
Avail: NTIS HC A06/MF A01

The conservation equations, finite-domain equations, and solution procedures which form the basis of the PHOENICS computer code system are described. Auxiliary relations are also discussed including boundary and internal conditions, thermodynamic properties, and transport property relations. The program system is designed to simulate phenomena of fluid mechanics, heat and mass transfer, and chemical reactions. M.G.

N83-21821# Imperial Coll. of Science and Technology, London (England).
DATA INPUT FROM SATELLITE
D. Brian Spalding *In its* PHOENICS Computer Code Seminar Nov. 1982 p 55-92 refs (For primary document see N83-21818 11-61)
Avail: NTIS HC A06/MF A01

The relations between the programs and subroutines of the PHOENICS satellite codes are discussed. The functions of the individual satellite subroutines in preparing data items for input to the central core of the PHOENICS system (EARTH) are discussed. Several variations of laminar pipe flow are computed to illustrate the use of the routines. M.G.

N83-21822# Imperial Coll. of Science and Technology, London (England).
THE TEST BATTERY GENERAL
D. Brian Spalding *In its* PHOENICS Computer Code Seminar Nov. 1982 p 93-114 (For primary document see N83-21818 11-61)
Avail: NTIS HC A06/MF A01

The use of the TESTSAT2 subroutine as a 'test battery' for running simple PHOENICS cases is discussed. The 'test battery' function of TESTSAT2 refers to the fact that is is repeatedly re-run, and the results are checked against reference values so that any changes can be detected and diagnosed. M.G.

N83-21823# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
LIPSCHITZ PROPERTIES OF SOLUTION IN MATHEMATICAL PROGRAMMING
Bernard Cornet and Guy Laroque Aug. 1982 22 p refs
(Contract N00014-79-C-0685)
(AD-A121740; TR-369) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper, we are concerned with the behavior of the solutions of problems and also with the Lipschitzian dependence of the set of solutions with respect to the parameter alpha. The paper is organized as follows. The main theorems of the paper are stated. Sufficient conditions are given to have (1) local uniqueness of solutions and (2) Lipschitzian dependence of the solution with respect to the parameter alpha. The proofs of the theorems are given. The main tool, in this analysis, is an implicit function theorem for Lipschitzian mappings due to Clarke (see also Hiriart-Urruty). The main idea is to write the generalized equation as a system of Lipschitzian mapping, to which Clarke's implicit function can be applied. The notion of generalized derivative of the projection mapping on a convex are of particular use. GRA

N83-21824# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
LEARNING TO PLAN IN LISP Interim Report
John R. Anderson, Robert Farrell, and Ron Sauers 1 Nov. 19[illegible]2 73 p refs
(Contract N00014-81-C-0335)
(AD-A121736; ONR-82-1) Avail: NTIS HC A04/MF A01 CSCL 09/2

Protocols have been gathered of the first 30 hours of the learning of LISP. A simulation, GRAPES, has been developed that models the processes by which subjects write LISP functions to meet problem specifications. The GRAPES simulation is a goal-factored production system as specified in the ACT* theory (Anderson, 1983). The results are reported of the simulations of a number of problems and these are compared to the human protocols. GRAPES does simulate the top-down depth-first flow of control exhibited by subjects and produces code very similar to subject code. Special attention is given to modelling student solutions by analogy, how students learn from doing, and how failures of working memory affect the course of problem solving.
Author (GRA)

N83-21825# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
AN EVALUATION OF THE NEEDS AND REQUIREMENTS FOR

THE ESTABLISHMENT OF AN ADA (TRADE NAME) LIAISON ORGANIZATION Interim Report, Aug. 1981 - Sep. 1982
Norman D. Jorstad, John A. N. Lee, and Samuel J. Lomonaco, Jr. Sep. 1982 32 p
(Contract MDA903-79-C-0202)
(AD-A122286; AD-E500546; IDA-P-1681; IDA/HQ-82-24869) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report examines the needs of the Ada Joint Program Office (AJPO) in the establishment of an organization (to be called the Ada Liaison Organization (ALO)) for the 'sustenance' of the Ada language following the acceptance of the language as a National standard and during the early stages of implementation, expansion of applicability, and development of supporting systems. It is proposed, in view of the number of overlapping needs of various responsibilities, that such an organization be formed as a single unit so as to maintain coordination, but with distinct subentities interacting with the differing internal and external agencies which have cognizance of some phase of the Ada activity. The ultimate responsibility for the continued support and development of Ada remains with AJPO. The Ada Liaison Organization will provide recommendations for the administration of the Military Standard, the American National Standard and other related standards or specifications. The proposed charter of the ALO is presented in the Appendix. GRA

N83-21826# Harvard Univ., Cambridge, Mass. Center for Research in Computing Technology.
EFFICIENT SYMBOLIC ANALYSIS OF PROGRAMS
John H. Reif and Harry R. Lewis Dec. 1982 53 p refs
(Contract N00014-80-C-0674)
(AD-A122660; TR-37-82) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper is concerned with constructing, for each expression in a given program text, a symbolic expression whose value is equal to the value of the text expression for all executions of the program. A cover is a mapping from text expressions to such symbolic expressions. Covers can be used for constant propagation, code motion, and a variety of other program optimizations. Covers can also be used as an aid in symbolic program execution and for finding loop invariants for program verification. We describe a direct (non-iterative) algorithm for computing a cover. The cover computed by an algorithm is characterized as the minimum of a certain fixed point equation, and is in general a better cover than might be computed by iteration methods (which can compute fixed point covers which are not minimal). Our algorithm is efficient and applicable to all flow graphs. A variant of an algorithm is implemented by (KK) in an optimizing compiler for PASCAL. R1 extends our algorithm to symbolic analysis of programs with records, such as LISP and PASCAL programs. Author (GRA)

N83-21827# Hanford Engineering Development Lab., Richland, Wash.
GUIDELINES FOR TECHNICAL REVIEWS OF SOFTWARE PRODUCTS
N. P. Wilburn Oct. 1982 38 p refs
(Contract DE-AC06-76FF-02170)
(DE83-003762; HEDL-TC-2132-Rev-1) Avail: NTIS HC A03/MF A01

A guideline is given for technical review of products developed during a software life cycle. Purposes and benefits of reviews are given. Varieties of reviews, when they should take place, roles of the reviewers and products of the review are described. DOE

N83-21828# Los Alamos Scientific Lab., N. Mex.
USER'S MANUAL FOR HDR3 COMPUTER CODE
Connie J. Arundale (New Mexico Univ., Albuquerque) Oct. 1982 78 p refs
(Contract W-7405-eng-36)
(DE83-003993; LA-9560-M) Avail: NTIS HC A05/MF A01

A description of the HDR3 computer code and instructions for its use are provided. HDR3 calculates space heating costs for a hot dry rock (HDR) geothermal space heating system. The code also compares these costs to those of a specific oil heating system in use at the National Aeronautics and Space Administration Flight Center at Wallops Island, Virginia. HDR3 allows many HDR system parameters to be varied so that the user may examine various reservoir management schemes and may optimize reservoir design to suit a particular set of geophysical and economic parameters. DOE

N83-21829# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Electrical and Computer Engineering.
DESIGN OF RESISTIVE MULTIPLE-VALUED DIGITAL-TO-ANALOG CONVERSION LADDERS
S. K. Mitra Jun. 1982 6 p refs
(Contract W-7405-eng-48)
(DE83-000771; UCID-19445) Avail: NTIS HC A02/MF A01

A general procedure for designing resistive ladders for converting data in arbitrary m-valued representation to its analog equivalent is outlined. DOE

N83-21830# Sandia Labs., Albuquerque, N. Mex.
EDIT: A CHARACTER-STRING-REPLACEMENT ROUTINE FOR FLEXTRAN LANGUAGE PROGRAMS
William F. Chambers Jul. 1982 14 p
(Contract DE-AC04-76DP-00789)
(DE82-019958; SAND-82-1313) Avail: NTIS HC A02/MF A01

EDIT is a program written in the Flextran language for editing other Flextran programs. EDIT provides the string replacement capabilities which are required during program development but which are not provided for by the built-in editing routines which are a part of Flextran. DOE

N83-21831# Pacific Northwest Lab., Richland, Wash.
USER MANUAL FOR AQUASTOR: A COMPUTER MODEL FOR COST ANALYSIS OF AQUIFIER THERMAL ENERGY STORAGE COUPLED WITH DISTRICT HEATING OR COOLING SYSTEMS. VOLUME 1: MAIN TEXT
H. D. Huber, D. R. Brown, and R. W. Reilly Apr. 1982 210 p refs
(Contract DE-AC06-76RL-01830)
(DE82-013891; PNL-4236-Vol-1) Avail: NTIS HC A10/MF A01

A computer model called AQUASTOR was developed for calculating the cost of district heating (cooling) using thermal energy supplied by an aquifer thermal energy storage (ATES) system. The AQUASTOR model can simulate ATES district heating systems using stored hot water or ATES district cooling systems using stored chilled water. AQUASTOR simulates the complete ATES district heating (cooling) system, which consists of two principal parts: the ATES supply system and the district heating (cooling) distribution system. The supply system submodel calculates the life-cycle cost of thermal energy supplied to the distribution system by simulating the technical design and cash flows for the exploration, development, and operation of the ATES supply system. The distribution system submodel calculates the life-cycle cost of heat (chill) delivered by the distribution system to the end-users by simulating the technical design and cash flows for the construction and operation of the distribution system. DOE

N83-21832# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
USE OF COMCAN 3 IN SYSTEM DESIGN AND RELIABILITY ANALYSIS
Dale M. Rasmuson, James C. Shepherd, Neldon H. Marshall, and L. Robert Fitch Mar. 1982 178 p refs
(Contract DE-AC07-76ID-01570)
(DE82-015386; EGG-2187) Avail: NTIS HC A09/MF A01

The COMCAN III computer program and its use are described. The COMCAN III is a tool that can be used by the reliability analyst performing a probabilistic risk assessment or by the designer of a system desiring improved performance and efficiency. The COMCAN III can be used to determine minimal cut sets of a fault tree, to calculate system reliability characteristics, and to perform qualitative common cause failure analysis. DOE

N83-21833# Battelle Pacific Northwest Labs., Richland, Wash.
STEREO AND MOTION IN THE DISPLAY OF 3-D SCATTERGRAMS
R. J. Littlefield Apr. 1982 6 p refs Presented at 8th Ann. Computer Graphics Conf., Detroit, 4 May 1982
(Contract DE-AC06-76RL-01830)
(DE82-014853; PNL-SA-10380; CNOF-820577-1) Avail: NTIS HC A02/MF A01

A display technique is described that is useful for detecting structure in a 3 dimensional distribution of points. The technique uses a high resolution color raster display to produce a 3-D scattergram. Depth cueing is provided by motion parallax using a capture-replay mechanism. Stereo vision depth cues can also be provided. Some general aspects of stereo scattergrams are discussed along with their implementation as red/green anaglyphs. These techniques were used with data sets containing over 20,000 data points. They can be implemented on relatively inexpensive hardware. DOE

N83-21834# Sandia Labs., Albuquerque, N. Mex.
GBT0884 PROGRAMMER/USER GUIDE
L. E. Jennings Jun. 1982 77 p refs
(Contract DE-AC04-76DP-00789)
(DE82-017374; SAND-82-1116) Avail: NTIS HC A05/MF A01

Program GBT0884 which translates Gerber photo plotting codes into the Applicon AGS/884 (APPLE 3D) data structure which may be further processed to produce an Applicon AGS/880-I interactive graphics file is given. DOE

N83-21835# California Univ., Livermore. Lawrence Livermore Lab.
MULTIPROCESSOR SIMULATORS USER'S MANUAL
T. Axelrod, L. Chase, P. Eltgroth, and L. Sloan 10 Nov. 1982 90 p
(Contract W-7405-eng-48)
(DE83-002897; UCID-19594) Avail: NTIS HC A05/MF A01

MPSIM is a simulator which provides a programmer with the facilities to create and debug programs intended to execute on a multiprocessor. Additionally, through a trace-driven hardware simulator, it permits the performance of these programs on a specific multiprocessor (currently the S-1 Mk IIa) to be estimated. The information necessary to use the simulator and interpret its output is given. The techniques utilized within the simulator are described briefly. DOE

N83-21836# California Univ., Livermore. Lawrence Livermore Lab.
NASSI: A STRUCTURED FLOWCHART DRAWING PROGRAM
Stephen Wong 5 Nov. 1982 32 p refs
(Contract W-7405-eng-48)
(DE83-003318; UCID-19595) Avail: NTIS HC A03/MF A01

The Nassi-Shneiderman structured flowchart symbols are flowcharting analogies to some of the structured programming constructs, NASSI, a FORTRAN program, was written to create and modify structured flowcharts. The user interacts with the program through an alphanumeric terminal. The output file containing the structured flowcharts may be printed on a line printer. The program was written to run on the LSI-11/02 computer under the RT-11, Version 3, operating system. However, it should be easily transportable because of its limited use of the nonstandard subroutines ASSIGN, DECODE, and ENCODE. The output file can be easily edited by the text editor TECO for insertion into a MACRO or FORTRAN source code as a block of comment lines. DOE

N83-21837# Argonne National Lab., Ill. Mathematics and Computer Science Div.
AN LMA-BASED THEOREM PROVER
Ewing L. Lusk and Ross A. Overbeck Dec. 1982 33 p refs
(Contract W-31-109-eng-38; Grant NSF MCS-79-03870)
(DE83-005945; ANL-82-75) Avail: NTIS HC A03/MF A01

A theorem prover is constructed from the facilities provided by Logic Machine Architecture (LMA). This program is not part of LMA itself, but illustrates the level of inference-based system which can be constructed from the LMA package of tools. It is a clause-based theorem prover supporting a wide variety of techniques which have proven valuable over the years in a long-running automated deduction research project. In addition, it is designed to present a convenient, interactive interface to its users which includes a number of useful utility commands. DOE

62 COMPUTER SYSTEMS

Includes computer networks.

N83-21838# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science and Mathematics.
DCN/SEEDIS: THE DISTRIBUTED COMPUTER NETWORK (DCN) AND SOCIO-ECONOMIC-ENVIRONMENTAL DEMOGRAPHIC INFORMATION SYSTEM (SEEDIS). AN INTRODUCTION TO THE DISTRIBUTED COMPUTER NETWORK
Virginia A. Sventek Sep. 1982 130 p
(Contract DE-AC03-76SF-00098)
(DE83-003541; LBL-PUB-3022) Avail: NTIS HC A07/MF A01

This introduction was designed to serve as support documentation for a five day course presented to DOL/ETA at Regional Offices by LBL staff. At these presentations, new users of the DCN receive instruction on the basic components of the VAX 11/780 minicomputers of which the DCN is comprised, including VMS (the VAX 11/780 Operating System), use of interactive terminals with VMS, an overview of the VMS directory structure, introduction to a text editor, and an introduction to Datatrieve (a data entry and retrieval system developed by Digital Equipment Corporation). Specific topics presented include: use of the terminal keyboard; logging on to VMS (the VAX 11/780 operating system); VMS directory structure; files manipulation; and introduction to datatrieve. DOE

N83-21839# Sandia Labs., Albuquerque, N. Mex.
SIMULATION STUDY OF THE CENTRAL COMPUTING NETWORK
L. Carol Jones Oct. 1982 38 p refs
(Contract DE-AC04-76DP-00789)
(DE83-001713; SAND-82-0853) Avail: NTIS HC A03/MF A01

A local computer network is under development at Sandia National Laboratories to upgrade the performance of existing computer systems and to provide new capabilities for users. Network objectives include easy expansion for future needs and reliable security measures. A discrete event simulation, developed from simulation work done at Lawrence Livermore National Laboratories, was used to investigate unresolved questions concerning the topology and protocols for the network. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N83-21840*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DESIGN OF THE FLUTTER SUPPRESSION SYSTEM FOR DAST ARW-IR
Jerry R. Newsom, Anthony S. Pototzky (Kentron International, Inc.), and Irving Abel Mar. 1983 15 p refs Presented at the AIAA/ASME/ASCE/AHS 24th Struct., Struct. Dyn. and Mater. Conf., Lake Tahoe, Nev., 2-4 May 1983
(NASA-TM-84642; NAS 1.15:84642) Avail: NTIS HC A02/MF A01 CSCL 01C

The design of the flutter suppression system for a remotely-piloted research vehicle is described. The modeling of the aeroelastic system, the methodology used to synthesized the control law, the analytical results used to evaluate the control law performance, and ground testing of the flutter suppression system

onboard the aircraft are discussed. The major emphasis is on the use of optimal control techniques employed during the synthesis of the control law. Author

N83-21841*# National Bureau of Standards, Washington, D.C. Industrial Systems Div.
AN OVERVIEW OF COMPUTER VISION Final Report
William B. Gevarter Sep. 1982 169 p refs
(NASA-CR-170119; NAS 1.26:170119; NBSIR-82-2582) Avail: NTIS HC A08/MF A01 CSCL 09B

An overview of computer vision is provided. Image understanding and scene analysis are emphasized, and pertinent aspects of pattern recognition are treated. The basic approach to computer vision systems, the techniques utilized, applications, the current existing systems and state-of-the-art issues and research requirements, who is doing it and who is funding it, and future trends and expectations are reviewed. Author

N83-21842# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Bereich Raumfahrt.
SURVEY OF THE STATE OF ART IN ROBOTICS AND ARTIFICIAL INTELLIGENCE, VOLUME 2 Final Report
G. Thieme, P. Lux, R.-J. Knappmann (Fraunhofer-Inst. fuer Produktionstechnik und Automatisierung), and U. Schmidt (Fraunhofer-Inst. fuer Produktionstechnik und Automatisierung) Paris ESA Jul. 1981 175 p refs
(Contract ESTEC-4514/80/NL-PP(SC))
(ESA-CR(P)-1674) Avail: NTIS HC A08/MF A01

This survey presents the state of the art in robotics and AI with emphasis on control and intelligence. It gives an introduction and summary description of robots and AI, identifies main application areas in space and benefits of the new technologies. Basic methods and concepts are illustrated. The state of the art, evolution trends and problem areas are described for industrial robots and space systems. Two reference missions are used to identify space opportunities. The potential application of existing know-how to space usage is identified. Recommendations for future research and development are given to overcome the problem areas. The survey comprises inventories of relevant publications, firms and institutions and know-how. Author

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N83-21843 National Physical Lab., Teddington (England).
PROBLEMS IN THE STATEMENT OF UNCERTAINTIES
P. J. Campion Nov. 1982 8 p
(NPL-DPMA-1) Copyright. Avail: Issuing Activity

For convenience, the metrological problems discussed are listed: The demarcation problems associated with several differing but compatible procedures, the need for an agreed conceptual framework suitable for all procedures, a procedure for combining systematic uncertainties, a procedure for combining random and systematic uncertainties, and the confidence level to be adopted. Author

N83-21844# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
A NATURAL COORDINATE SYSTEM FOR NONLINEAR SYSTEMS
Renjeng Su and L. R. Hunt [1983] 9 p refs
Avail: NTIS HC A02/MF A01

A natural coordinate system for nonlinear systems of the form $x = f(x) + g(x)u$ is discussed where x is a element of R(N), u is an element of R, and f and g are analytic, vector-valued functions on R(N). It is shown that in these coordinates the equation becomes a system with only feedback paths (no feedforwards), if feedback linearizability conditions are satisfied. M.G.

N83-21845*# Texas Technological Univ., Lubbock. Dept. of Mathematics.
LINEAR APPROXIMATIONS OF NONLINEAR SYSTEMS
L. R. Hunt and Renjeng Su [1983] 15 p refs
(Grants NAG2-189; NAG2-203; Contract N00014-76-C-1136)
(NASA-CR-170036; NAS 1.26:170036) Avail: NTIS HC A02/MF A01 CSCL 12A

The development of a method for designing an automatic flight controller for short and vertical take off aircraft is discussed. This technique involves transformations of nonlinear systems to controllable linear systems and takes into account the nonlinearities of the aircraft. In general, the transformations cannot always be given in closed form. Using partial differential equations, an approximate linear system called the modified tangent model was introduced. A linear transformation of this tangent model to Brunovsky canonical form can be constructed, and from this the linear part (about a state space point x sub 0) of an exact transformation for the nonlinear system can be found. It is shown that a canonical expansion in Lie brackets about the point x sub 0 yields the same modified tangent model. M.G.

N83-21846*# Texas Technological Univ., Lubbock. Dept. of Mathematics.
OBSERVABILITY FOR TWO DIMENSIONAL SYSTEMS
L. R. Hunt and Renjeng Su [1981] 13 p refs
(Grants NAG2-189; NAG2-203; Contract N00014-76-C-1136)
(NASA-CR-170035; NAS 1.26:170035) Avail: NTIS HC A02/MF A01 CSCL 12A

Sufficient conditions that a two-dimensional system with output is locally observable are presented. Known results depend on time derivatives of the output and the inverse function theorem. In some cases, no informaton is provided by these theories, and one must study observability by other methods. The observability problem is dualized to the controllability problem, and the deep results of Hermes on local controllability are applied to prove a theorem concerning local observability. M.G.

N83-21847*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTIPLE-GRID CONVERGENCE ACCELERATION OF VISCOUS AND INVISCID FLOW COMPUTATIONS
Gary M. Johnson 1983 28 p refs Presented at the Intern. Multigrid Conf., Copper Mountain, Colo., 6-8 Apr. 1983; sponsored in part by Air Force
(NASA-TM-83361; E-1623; NAS 1.15:83361) Avail: NTIS HC A03/MF A01 CSCL 12A

A multiple-grid algorithm for use in efficiently obtaining steady solution to the Euler and Navier-Stokes equations is presented. The convergence of a simple, explicit fine-grid solution procedure is accelerated on a sequence of successively coarser grids by a coarse-grid information propagation method which rapidly eliminates transients from the computational domain. This use of multiple-gridding to increase the convergence rate results in substantially reduced work requirements for the numerical solution of a wide range of flow problems. Computational results are presented for subsonic and transonic inviscid flows and for laminar and turbulent, attached and separated, subsonic viscous flows. Work reduction factors as large as eight, in comparison to the basic fine-grid algorithm, were obtained. Possibilities for further performance improvement are discussed. M.G.

N83-21848# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATION OF SUBOPTIMAL RANDOMIZED STRATEGIES FOR STEERING A RANDOM MOTION OF A POINT UNDER PARTIAL OBSERVATION
Yaakov Yavin May 1982 29 p refs
(CSIR-TWISK-265) Avail: NTIS HC A03/MF A01

Consider the random motion in the plane of a point M, whose velocity is perturbed by a Gaussian white noise. Only noisy nonlinear observations taken on the point location (state) are available to M. Using the available observations, the point M wishes to steer itself into a given target set by choosing a randomized

strategy. Sufficient conditions on weak optimal randomized strategies are derived. An algorithm for computing weak suboptimal randomized strategies is suggested, and these are computed for a variety of cases. Author

N83-21849# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMBINED PENALTY-MULTIPLIER NONLINEARLY CONSTRAINED OPTIMIZATION METHODS FOR ENFORCING CONSERVATION OF INTEGRAL INVARIANTS IN SHALLOW-WATER EQUATIONS MODELS
I. M. Navon and R. deVilliers Jun. 1982 40 p refs
(CSIR-TWISK-268) Avail: NTIS HC A03/MF A01

An augmented Lagrangian multiplier-penalty method is applied for the first time to solving the problem of enforcing simultaneous conservation of the nonlinear integral invariants of the shallow-water equations on a limited area domain. The method approximates the nonlinearity constrained minimization problem by solving a series of unconstrained minimization problems. The computational efficiency and accuracy of the method is tested using two finite-difference solvers of the nonlinear shallow-water equations on a beta-plane. The method is also compared with a pure quadratic penalty approach. The method yielded satisfactory results in the conservation of the integral constraints while the additional CPU time required did not exceed 15% of the total CPU time spent on the numerical solution of the shallow water equations. The methods proved to be simple in their implementation and they have a broad scope of applicability to other problems involving nonliner constraints; for instance, the variational nonlinear normal mode initialization. Author

N83-21850# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A DISCRETE KALMAN FILTER FOR A CLASS OF NON-LINEAR STOCHASTIC SYSTEMS
Yaakov Yavin Jun. 1982 25 p refs
(CSIR-TWISK-269) Avail: NTIS HC A02/MF A01

A procedure for the discretization (in time) of a nonlinear systems equation is introduced. Based on this procedure, a version of the discrete (in time) Kalman filter is suggested for the estimation of (x(tk)). The filter proposed here turns out to be more economical in the amount of computation and in memory storage requirements than the linearized or extended Kalman filters, or the truncated nonlinear filters. Two examples are numerically solved. Author

N83-21851# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SHARPER ERROR ESTIMATES IN ADAPTIVE QUADRATURE
D. P. Laurie May 1982 14 p refs
(TWISK-259) Avail: NTIS HC A02/MF A01

A typical technique in adaptive quadrature is to compute two approximations to an integral, using different quadrature formulae, and to subdivide an interval where these approximations are not close enough to each other. A device is introduced which on each sub-interval allows a much sharper error estimate than the difference of the two approximations. The improved estimate is in fact an error bound if both quadrature formulae converge monotonically and the more accurate formula is also the one with a higher convergence rate. The device is incorporated into two existing adaptive integrators, and in both cases numerical results show greater reliability and increased efficiency. Author

N83-21852# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE CONVOLUTION OF THE NORMAL AND LOGNORMAL DISTRIBUTIONS
Douglas M. Hawkins May 1982 20 p refs
(TWISK-257) Avail: NTIS HC A02/MF A01

Let Z be a three parameter lognormal variate, and X approx. N(Z, tau to the 2 power). Expressions for the marginal distribution of X and the conditional distribution of Z given X are derived from these, the parameters of Z may easily be estimated using a sample of X values. An application to X-ray fluorescence counting of in situ gold grades is given. Author

N83-21853# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
PREDICTIVE DISCRIMINATION WITH COVARIATES
E. Liefde Raath Apr. 1982 20 p refs Submitted for publication
(CSIR-TWISK-262) Avail: NTIS HC A02/MF A01

The method of predictive discrimination, developed by Geisser, is extended to the case where some of the variables are regarded as covariates. Comparative studies show that the ordinary predictive method and the covariate method perform comparably in most cases but that the covariate method distinguishes better between nearly overlapping populations. The posterior probabilities are also more realistic for the covariate method. M.G.

N83-21854# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
INTERRING PREFERENCES IN MULTIPLE CRITERIA DECISION ANALYSIS USING A LOGISTIC REGRESSION MODEL
T. J. Stewart May 1982 30 p refs Submitted for publication Sponsored in part by Control Data
(CSIR-TWISK-254) Avail: NTIS HC A03/MF A01

A method is proposed for the analysis of multiple criteria decision making problems in an interactive environment, when decision maker preferences are inconsistent with a simple utility model and/or are self-inconsistent (e.g., showing intransitivities). A maximum likelihood estimation procedure is invoked which is based on a logistic regression model relating the probability of selecting one decision option over another to a linear function of attribute values. The method is illustrated by application to multi-objective linear programming, where it serves as an alternative to the method of Zionts and Wallenius, and allows for inconsistencies which are not satisfactorily handled in the Zionts-Wallenius approach. M.G.

N83-21855# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CLUSTER EXPANSION OF THE THREE-BODY PROBLEM: LOCAL INTERACTIONS
D. Eyre and T. A. Osborn (Manitoba Univ.) May 1982 27 p refs
(CSIR-TWISK-255) Avail: NTIS HC A03/MF A01

The ability of a cluster expansion to construct accurate approximate solutions for the three-body problem where the pairwise interactions are local potentials is investigated. The Karlsson-Zeiger integral equation formalism and the decoupling scheme of Bolle and Kuzmichev was employed to construct an effective inter-cluster potential for the three-body problem. This effective potential takes into account all virtual excitations of the three-body breakup channel. It is found that a simplifying approximation to the effective potential, utilizing only the first few terms of a cluster expansion, yields accurate numerical solutions in the bound state and low energy elastic scattering sectors. Numerical results for a system composed of three bosons interacting via the S-wave projection of a Yukawa potential is discussed. Author

N83-21856# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Mathematical Statistics.
UNION-INTERSECTION TESTS FOR SPHERICITY
C. J. Lombard May 1982 10 p refs
(Rept-80) Avail: NTIS HC A02/MF A01

Two union-intersection tests for the sphericity hypothesis are derived. An extension of the Kantorovich inequality is given in terms of elementary symmetric functions. Author

N83-21857# Cape Town Univ. (South Africa). Nonlinear Structural Mechanics Research Unit.
A REVIEW OF INFINITE ELEMENTS
L. Resende [1982] 27 p refs
Avail: NTIS HC A03/MF A01

The numerical modelling of infinite domain problems is considered. A brief review of the various techniques that were used to tackle the problem is given. The concept of mapped infinite

elements is then introduced and a family of two dimensional elements is derived. The use of coupled finite/infinite element meshes is discussed and remarks about the implementation of the infinite elements are made. Finally, numerical results for the Boussinesq problem of a point load on an elastic half-space are presented to validate the elements. The mapped infinite elements were implemented in the finite element code NOSTRUM. Author

N83-21858# Harvard Univ., Cambridge, Mass. Computation Lab.

LOGARITHMIC DEPTH CIRCUITS FOR ALGEBRAIC FUNCTIONS

John H. Reif Nov. 1982 25 p refs

(Contract N00014-80-C-0674; Grant NSF MCS-79-21024)

(AD-A122661; TR-35-82) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper describes circuits for computation of various algebraic functions on polynomials, power series, integers, and reals. Let R(x) be the polynomials and power series over a commutative ring which supports a fast Fourier transform and let Zx be the polynomials and power series over the rationals Q. For polynomials of degree n-1, we give circuits of depth O(log n) for computing - the m-th power of a polynomial and the product of m polynomials in R(x), where m=O(n) - the symmetric functions on R(x)- the remainder and quotient of division of polynomials in Q(x)- interpolation of a polynomial in Q(x). For power series with n given low order terms, we give circuits of depth o(log n) for computing the first n low order terms of - the m-th power of a power series in R(x) and the product of m power series in R(x) where m=0(n) the composition of power series in R(x) - the reciprocal of a power series and the division of two power series in Q(x) - the reversion of a power series in Q(x) - various elementary functions applied to power series in Q(x) such as (fixed) powers, roots, exponentation, logarithm, sin, cos, arctangent, and hyperbolic cosine. GRA

N83-21859# Yale Univ., New Haven, Conn. Dept. of Computer Science.

SOME OBSERVATIONS ON THE GENERALIZED CONJUGATE GRADIENT METHOD

Stanley C. Eisenstat Sep. 1982 11 p refs Presented at the Interam. Workshop on Numerical Methods, Caracas, 14-18 Jun. 1982

(Contracts N00014-76-C-0277; N00014-82-K-0184; Grant NSF MCS-81-04874)

(AD-A122653; RR-244) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider the system of linear equations Az = b where the coefficient matrix A is large and sparse and has positive definite symmetric part M = (A+A(T))/2. Two methods for solving such systems, the generalized conjugate gradient method of Concus and Golub and Widlund and Craig's method applied to a symmetrically preconditioned auxiliary system are compared. M.G.

N83-21860# Yale Univ., New Haven, Conn. Dept. of Computer Science.

NONLINEAR IMPLICIT ONE-STEP SCHEMES FOR SOLVING INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS WITH STEEP GRADIENTS

Jiachang Sun and Ken Jackson (Toronto Univ.) 1 Sep. 1982 33 p refs Sponsored in part by the Natural Sciences and Engineering Research Council of Canada

(Contract N00014-82-K-0184)

(AD-A122615; TR-215/82) Avail: NTIS HC A03/MF A01 CSCL 12/1

A general theory for nonlinear implicit one-step schemes for solving initial value problems for ordinary differential equations is presented in this paper. The general expansion of symmetric implicit one-step schemes having second-order is derived and stability and convergence are studied. As examples, some geometric schemes are given. Based on previous work of the first author on a Generalization of Means, a fourth-order nonlinear implicit one-step scheme (GMS) is presented for solving equations with steep gradients. Also, a hybrid method based on the GMS and a fourth-order linear scheme is discussed. Some numerical results are given. Author (GRA)

N83-21861# Advanced Information and Decision Systems, Mountain View, Calif.

A GENERAL THEORY FOR BAYESIAN MULTITARGET TRACKING AND CLASSIFICATION - GENERALIZED TRACKER/CLASSIFIER (GTC) Technical Report, 15 Jul. 1981 - 1 Jul. 1982

C. Y. Chong, S. Mori, E. Tse, and R. P. Wishner 7 Dec. 1982 100 p refs

(Contract MDA903-81-C-0333; ARPA Order 4272)

(AD-A122618; AI/DS-TR-1015-1) Avail: NTIS HC A05/MF A01 CSCL 12/1

A general theory for the tracking and classification of multiple targets using a Bayesian approach is presented, together with its specialization to independent, identically distributed target models. The implementation of the theory is through the Generalized Tracker/Classifier. Simulation results to illustrate the algorithm are also given. Author (GRA)

N83-21862# Harvard Univ., Cambridge, Mass. Computation Lab.

A MULTIPROCESS NETWORK LOGIC WITH TEMPORAL AND SPATIAL MODALITIES

John H. Reif and Aravinda Frasad Sistla Oct. 1982 18 p refs Revised

(Contract N00014-80-C-0674; Grant NSF MCS-79-21024)

(AD-A122827; TR-29-82-Rev) Avail: NTIS HC A02/MF A01 CSCL 12/1

We introduce a modal logic which can be used to formally reason about synchronous fixed connection multiprocess networks such as VLSI. Our logic has both temporal and spatial modal operators. The various temporal modal operators allow us to relate properties of the current state of a given process with properties of succeeding states of the given process. Also, the spatial modal operators allow us to relate properties of the current state of a given process with properties of the current state of neighboring processes. Many interesting properties for multiprocessor networks can be elegantly expressed in our logic. We give examples of the diverse applications of our logic to packet routing firing squad problems, and systolic algorithms. Author (GRA)

N83-21863# Harvard Univ., Cambridge, Mass. Computation Lab.

DERIVING EFFICIENT GRAPH ALGORITHMS

John H. Reif and William Scherlis (Carnegie-Mellon Univ.) Aug. 1982 16 p refs

(Contract N00014-80-C-0674; Grant NSF MCS-79-21024)

(AD-A122828; TR-30-82) Avail: NTIS HC A02/MF A01 CSCL 12/1

Ten years ago Hopcroft and Tarjan discovered a class of very fast algorithms for solving graph problems such as biconnectivity and strong connectivity. While these depth-first-search algorithms are complex and can be difficult to understand, the problems they solve have simple combinatorial definitions that can themselves be considered algorithms, though the might be very inefficient or even infinitary. We demonstrate here how the efficient algorithms can be systematically derived using program transformation steps from the intuitive but preliminary definitions. There are several justifications for this work. First, we believe that the evolutionary approach used in this paper offers more natural explanations of the algorithms than the usual a posteriori proofs that appear in textbooks. Second, the derivations illustrate several high-level principles of program derivation and suggest methods by which these principles can be realized by sequences of program transformation steps. Third, these examples illustrate how external domain-specific knowledge can enter into the program derivation process. This is the first occasion that such efficient graph algorithms have been systematically derived. Author (GRA)

N83-21864# California Univ., Livermore. Lawrence Livermore Lab.
LJUNG'S ALGORITHM FOR STATE SPACE SYSTEM IDENTIFICATION: A USER'S GUIDE FOR THE COMPUTER PROGRAM
Don Gavel Dec. 1982 31 p refs
(Contract W-7405-eng-48)
(DE83-004056; UCID-19617) Avail: NTIS HC A03/MF A01

How to use the LKFID computer program on the CDC7600 and VAX computers is explained. The program is a dynamic system model identifier which, given a basic shell for the system model (basically a set of coupled differential equations with unknown coefficients), and experimental input/output data from the system under test, produces estimates of the unknown coefficients. DOE

N83-21865# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Physics.
APPLIED MATHEMATICS OF TRANSPORT THEORY Progress Report, Sep. 1981 - Sep. 1982
William Greenberg and Paul F. Zwiefel 1982 31 p refs
(Contract DE-AS05-80ER-10711)
(DE83-003208; DOE/ER-10711/1) Avail: NTIS HC A03/MF A01

Research is reported for four basic areas: existence theory for the nonlinear Boltzmann equation; transport theory; gas dynamics; and plasma stability. DOE

N83-21866# Oak Ridge National Lab., Tenn. Fusion Energy Div.
APPROXIMATIONS TO FUNCTION VALUES AND FIRST DERIVATIVES FROM SETS OF INTEGRAL-AVERAGED FUNCTION VALUES
D. E. Arnurius and E. C. Crume, Jr. Sep. 1982 44 p refs
(Contract W-7405-eng-26)
(DE83-000471; ORNL/TM-8436) Avail: NTIS HC A03/MF A01

Stimulated by the necessity of numerically integrating the one-dimensional, first-order, magnetic-flux-surface-averaged particle continuity equation to study impurity transport in Tokamaks, we have investigated how to obtain estimates of functions and their first derivatives correct to second order in the grid spacing for arbitrary grids. Using integral-averaged values with arbitrary weight functions, we readily find two-term liner approximations to the functions that satisfy the accuracy criterion. However, in the case of two-term linear approximations to the first derivative, we find that the grid partition must satisfy a nodal equation to obtain the desired accuracy. When the entire grid cannot be set up to satisfy the nodal equation, transitions involving three-term linear approximations to the derivative are required. We also determine the point between two grid points at which the integral-averaged function value can be identified with the function evaluated at that point. Finally, we give examples of rid selection for two different weight functions: $w = 1$ and $w = r$. DOE

N83-21867# Oak Ridge National Lab., Tenn. Computer Sciences.
INTERPOLATION OF DATA ON THE SURFACE OF A SPHERE
Robert Renka Oct. 1982 48 p refs
(Contract W-7405-eng-26)
(DE83-001592; ORNL/CSD-108) Avail: NTIS HC A03/MF A01

Methods and software for constructing a C(1) interpolant of data values associated with arbitrarily distributed nodes on the surface of the unit sphere are discussed. The procedure consists of generating a triangulation of the nodes, estimating gradients at the nodes by a local method, and constructing a triangle based interpolant of the data and gradient estimates. DOE

N83-21868# Los Alamos Scientific Lab., N. Mex.
VARIABLE EDDINGTON FACTORS AND FLUX-LIMITING DIFFUSION COEFFICIENTS
P. P. Whalen 1982 27 p refs Presented at Los Alamos/CEA Conf., Paris, 19 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014071; LA-UR-82-1037; CONF-820429-10) Avail: NTIS HC A03/MF A01

Variable Eddington factors and flux limiting diffusion coefficients arise in two common techniques of closing the moment equations of transport. The first two moment equations of the full transport equation are still frequently used to solve many problems of radiative or particle transport. An approximate analysis, developed by Levermore, exhibits the relation between the coefficients of the two different techniques. This analysis is described and then used to test the validity of several commonly used flux limiters and Eddington factors. All of the ad-hoc flux limiters have limited validity. All of the variable Eddington factors derived from some underlying description of the angular distribution function are generally valid. The use of coefficients from Minerbo's elegant maximum entropy Eddington factor analysis is suggested for use in either flux limited diffusion or variable Eddington factor equations. DOE

N83-21869# Los Alamos Scientific Lab., N. Mex.
GREEN'S FUNCTIONS OF THE ANDERSON-LATTICE HAMILTONIAN
B. H. Brandow 1982 5 p refs Presented at the Intern. Conf. on Valence Instabilities, Zurich, 13-16 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014063; LA-UR-82-970; CONF-820454-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Diagrammatic analysis provides an exact general form for the conduction-electron and f-electron Green's functions; both are determined by a single function G. Zubarev-Hubbard equations of motion are then used to obtain a Hubbard III type approximation for this G. The latter analysis incorporates some self-consistency requirements, to enforce consistency with the general diagrammatic result. This approximation goes beyond CPA by inclusion of resonance broadening type processes, and may possibly provide a well-defined Fermi surface. DOE

N83-21870# Los Alamos Scientific Lab., N. Mex.
METHODS FOR THE SOLUTION OF THE TWO-DIMENSIONAL RADIATION-TRANSFER EQUATION
Robert Weaver, Dimitri Mihalas (Sacramento Peak Observatory), and Gordon Olson 1982 41 p refs Presented at the Los Alamos/CEA Appl. Phys. Conf., Paris, 19-23 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014061; LA-UR-82-961; CONF-820429-9) Avail: NTIS HC A03/MF A01

The variable Eddington factor (VEF) approximation is used to solve the time-dependent two-dimensional radiation transfer equation. The transfer equation and its moments are derived for an inertial frame of reference in cylindrical geometry. Using the VEF tensor to close the moment equations, they are manipulated into a combined moment equation that results in an energy equation which is automatically flux limited. There are two separable facets in this method of solution. First, given the variable Eddington tensor, the efficient solution of the combined moment matrix equation is discussed. The second facet of the problem is the calculation of the variable Eddington tensor. Several options for this calculation, as well as physical limitations on the use of locally-calculated Eddington factors, are discussed. DOE

N83-21871# Argonne National Lab., Ill. Mathematics and Computer Science Div.
A METHODOLOGY FOR ALGORITHM DEVELOPMENT THROUGH SCHEMA TRANSFORMATIONS Ph.D. Thesis - Indian Inst. of Tech.
M. N. Muralidharan Jul. 1982 79 p refs
(Contract W-31-109-eng-38)
(DE83-003342; ANL-82-45) Avail: NTIS HC A05/MF A01

A programming methodology based on schema transformations is presented. Such an approach is a logical outcome of recent developments in program manipulating systems. Concurrent development of algorithms and their proofs of correctness is a significant feature of the proposed methodology. As the development process begins with an abstract schema, it is often possible to derive several related end algorithms in a single development process. This has implications in both the economics of software development and the understanding and teaching of algorithms.

The intial schematic specifications (a skeleton algorithm schema), the intermediate and final algorithm schemata are all expressed in Darlington's first-order recursion equation language exploiting set-theoretic constructs. A set of transformation rules together with a set of reduction rules for set expressions is then used to successively transform the schematic specification into different algorithm schemata. Most of the transformations are applications of a small number of common rewriting rules. DOE

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N83-21872*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTER PROGRAM TO MINIMIZE PREDICTION ERROR IN MODELS FROM EXPERIMENTS WITH 16 HYPERCUBE POINTS AND 0 TO 6 CENTER POINTS
Arthur G. Holms Nov. 1982 64 p refs
(NASA-TM-82995; E-1428; NAS 1.15:82995) Avail: NTIS HC A04/MF A01 CSCL 12A

A previous report described a backward deletion procedure of model selection that was optimized for minimum prediction error and which used a multiparameter combination of the F - distribution and an order statistics distribution of Cochran's. A computer program is described that applies the previously optimized procedure to real data. The use of the program is illustrated by examples. Author

N83-21873# Hochschule der Bundeswehr, Neubiberg (West Germany). Forschungsschwerpunkt Simulation und Optimierung deterministischer und stochastischer dynamischer Systeme.
SEMINAR ON STOCHASTICS [SEMINAR UEBER STOCHASTIK]
Oct. 1982 76 p refs In GERMAN Seminar held in Neubiberg, West Germany, 1982
Avail: NTIS HC A05/MF A01

The following topics were discussed at a seminar on stochastic process: parametric evaluation in the application of rudimentary examination game theory model to be used in safeguarding systems against different kinds of illegal activity; linear relationship for errors in variables and equations and in duplicated measurements; characterization, tests and estimates of cutliers; convergence speed for the random number method; convergence speed for the stochastic approximation method. For individual titles, see N83-21874 through N83-21879.

N83-21874# Augsburg Univ. (West Germany). Lehrstuhl fuer Statiskik.
ESTIMATION OF PARAMETERS BY AN UNDERSTANDING OF RUDIMENTARY PRELIMINARY NOTIONS [PARAMETERSCHAETZUNG BEI EINBEZIEHUNG RUDIMENTAERER VORKENNTNISSE]
G. Bamberg *In* Hochschule der Bundeswehr Seminar on Stochastics Oct. 1982 p 1-11 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

The development of a statistical method for the general elementary knowledge for user's need is discussed. The Bayes theorem demands from the user the details of unknown parameters concerning a priori distribution. Many parameters are considered and it is difficult to specify an adequate multivatiate a priori distribution. A typical situation is that the user has little information needed for the Bayes theorem and has more information than can be incorporated into the classical statistical methods.
Transl. by E.A.K.

N83-21875# Regensburg Univ. (West Germany). Fachberetch Mathematik.
THEORY OF GAME MODELS FOR SAFEGUARD SYSTEMS AGAINST DIFFERENT KINDS OF ILLEGAL ACTIVITY [SPIELTHEOREMSCNE MODELLE FUER SAFEGUARDS-SYSTEME GEGEN UNTERSCHIEDLICHE ARTEN ILLEGALER AKTIVITAET]
Dieter Bierlein *In* Hochschule der Bundeswehr Seminar on Stochastics Oct. 1982 p 12-26 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

The game theory model for decision making situations by the manager of a guarded location, in which the quality of the strategy of the oponent is determined by its budget, is outlined. The model is examined for the following situations: (1) one manager with one installation; (2) x-independent managers with one installation; (3) one manager with x-installations which are vulnerable to illegal activity. Criteria for the reliability of a control strategy are outlined and the necessary and extensive conditions for a budget under which a financial reliable strategy can be maintained are enumerated. Transl. by E.A.K.

N83-21876# Technische Universitaet, Munich (West Germany). Inst. fuer Oekonometrie und Statistik.
A LINEAR RELATIONSHIP WITH ERRORS IN VARIABLE AND EQUATIONS AND WITH REPLICABLE MEASUREMENTS [EINE LINEARE BEZIEHUNG MIT FEHLERN IN DEN VARIABLEN UND FEHLERN IN DER GLEICHUNG UND MIT REPLIZIERTEN MESSUNGEN]
H. Scheneeweiss *In* Hochschule der Bundeswehr Seminar on Stochastics Oct. 1982 p 27-37 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

The parameter identification of a linear relationship between observed variables was analyzed by regression theory. In cases where the variables are not directly observed and error free the model results into a linear relationship with errors in the variables which indicate different estimation characteristics. The model provides a consistent estimation so that it is possible to duplicate the measurements of an estimated measuring variance. In the one model the linear relationship between the latent variable is accurate, while in the second model it is assumed that it is superimposed by interfering variables. A test is developed based on maximum likelihood which distinguishes between the two models. Transl. by E.A.K.

N83-21877# Technische Hochschule, Aachen (West Germany). Inst. fuer Statistik und Wirtschaftsmathematik.
CHARAKTERISIERUNGEN, TESTS UND SCHAETZEN VON AUSREISSERN
B. Rauhut *In* Hochschule der Bundeswehr Seminar on Stochastics Oct. 1982 p 38-53 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

The need for a probability model in statistical experiments is discussed. The choice of a model is important till an adjusted model can be formulated. In estimation problems the situation is very subtle, since many estimation methods are very sensitive to such values. Two possibilities remain if no other causes can be found for these statistical outliers, change of the model or consider these values as outliers. Four methods are treated: (1) characterization of probability distribution; (2) description of outlier models; (3) testing of outlier samples; and (4) estimation of parameters of existing outliers. Transl. by E.A.K.

N83-21878# Hochschule der Bundeswehr, Neubiberg (West Germany). FB Fachbereich Elektrotechnik.
CONVERGENCE RELATIVITY OF PROCESSES FOR RANDOM FINDING [ZUR KONVERGENZGESCHWINDIGKEIT VON ZUFALLSSUCHVERFAHREN]
G. Rappl *In its* Seminar on Stochastics Oct. 1982 p 54-59 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

Random searches are optimization processes in which the point of reference is the realization of probability distribution. The influence of distribution on convergence speed is investigated in random search. These methods are characterized in every instant

and the incidental direction is shown, and consequently independent from the chosen direction an incidental random walk length is realized. An exponential convergence order in certain directions of the unit random walk length is indicated.
Transl. by E.A.K.

N83-21879# Giessen Univ. (West Germany). Inst. fuer Mathematisches.
CONVERGENCE VELOCITY FOR PROCESS OF STOCHASTIC APPROXIMATION [KONVERGENZGESCHWINDIGKEIT FUER VERFAHREN DER STOCHASTISCHEN APPROXIMATION]
G. Pflug *In* Hochschule der Bundeswehr Seminar on Stochastics Oct. 1982 p 60-72 refs In GERMAN (For primary document see N83-21873 11-65)
Avail: NTIS HC A05/MF A01

The Robbins-Monroe process was applied to find the zero position Theta of function f. A complete overview of convergence speed is presented and stochastic optimation problems are examined. A typical penalized Kiefer-Wolfowitz process converges agains the optimal solution. The convergence speed depends specifically on the relationship between functions q sub i and f, however, in each case it is smaller than any of the proper determined procedured. Transl. by E.A.K.

N83-21880# Istituto Universitario Navale, Naples (Italy). Lab. di Onde Elettromagnetische.
USE OF SAMPLING FUNCTIONS FOR THE ANALYSIS OF RADIATING STRUCTURES, VOLUME 1 Final Report
Ovidio M. Bucci, Giorgio Franceschetti, Giuseppe DElia, and Rocco Pierri Paris ESA Jan. 1982 134 p refs 2 Vol.
(Contract ESTEC-4380/80/NL-DG)
(ESA-CR(P)-1650-Vol-1) Avail: NTIS HC A07/MF A01

The application of sampling theory to the analysis and synthesis of offset parabolic reflector antennas is discussed. After a literature survey on both sampling theory and its applications to electromagnetics, the pseudo-sampling approach is presented and applied to the computation of the far field of a parabolic antenna. In order to minimize the computer time, algorithms were developed, tailored to the pseudo-sampling procedure. Then a computer code was developed and thoroughly validated from the precision and computer time points of view. Graphs of the time saving are provided with reference to GRASP II code. A general scheme of the problem is presented with emphasis on the sampling approach. S.L.

N83-21881# Istituto Universitario Navale, Naples (Italy). Lab. di Onde Elettromagnetische.
USE OF SAMPLING FUNCTIONS FOR THE ANALYSIS OF RADIATING STRUCTURES: PRAPSA PROGRAM MANUAL, VOLUME 2
Giuseppe DElia and Rocco Pierri Paris ESA Jan. 1982 38 p refs 2 Vol.
(Contract ESTEC-4380/80/NL-DG)
(ESA-CR(P)-1650-Vol-2) Avail: NTIS HC A03/MF A01

The computer program PRAPSA (Parabolic Reflector Antenna Pseudo Sampling Analysis) evaluates the radiation pattern of an offset parabolic reflector antenna (with a circular projected aperture) illuminated by a planar array of radiators. The program implements the pseudo sampling method using the P.O. approximation to compute the induced reflector currents. The reflector is supposed to be in the Fresnel zone with respect to the illuminating array, so that the Fresnel approximation is applied to compute the primary field. Author

N83-21882# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Dept.
DISTRIBUTIONS OF THE STANDARD DEVIATION AND SKEWNESS IN RANDOM SAMPLES FROM A GAMMA DENSITY: A NEW LOCK AT A CRAIG-PEARSON STUDY
K. O. Bowman and L. R. Shenton (Georgia Univ.) Jan. 1983 64 p refs
(Contract W-7405-eng-26)
(DE83-005983; ORNL/CSD-109) Avail: NTIS HC A04/MF A01

Using Taylor series, series for the first four moments of the standardized sample standard deviation and the sample skewness from Gamma populations are studied; the series, using a computer approach, are taken out to terms of order n(-24) (n the sample size) for the standard deviation, and n(-12) for the skewness. Summation techniques are required for the apparent divergency encountered; Pade (near the main diagonal in the table) and Levin algorithms are used. Although the latter seems to be weakly divergent, a best stopping member of a sequence can be located by comparison with exact results for n = 2 and n = 3. Comparisons are made with extended moment series, first of all for the moments, and secondly, for 4-moment distributional approximants. As backup assessments, simulation results in a few cases are given. DOE

N83-21883# Forschungsgruppe fuer Informationsverarbeitung und Mustererkennung, Karlsruhe (West Germany).
STANDARD METHODS OF IMAGE PROCESSING. PART 3: NUMERICAL ESTIMATE OF SERIES DEVELOPMENTS FOR PURPOSE CLASSIFICATION Final Report, 25 May 1982 [STANDARDMETHODEN DER BILDVERARBEITUNG. TEIL 3: NUMERISCHE BEWERTUNG VON RIEHENENTWICKLUNGEN FUER DIE ZIELKLASSIFIZIERUNG]
Manfred Bohner, Helmut Kazmierczak, and Udo Schifkowitz Bonn Bundesministerium der Verteidigung Jun. 1982 351 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung
(BMVG-FBWT-82-6; FIM-98) Avail: NTIS HC A16/MF A01; DOKZENTBW, Bonn DM 50

The performance of known linear and elementary nonlinear image transformations for feature extraction was numerically evaluated. The assessment based on real and artificial image data was done with regard to military applications. The shift-invariant image transformations Fourier Power Spectrum, R-Transformation, B-Transformation, and M-Transformation were investigated for object identification in the military field of investigation. The image transformations Fourier Power Spectrum, generalized Karhunen-Loeve Transformation, separable Karhunen-Loeve Transformation, Hadamard Transformation, Cosine Transformation, Sine Transformation, and Slant Transformation were investigated for object detection and classification in the military fields of targets tracking, target acquisition and aerial reconnaissance. Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N83-21884# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATION OF SUBOPTIMAL NASH STRATEGIES FOR A STOCHASTIC DIFFERENTIAL GAME UNDER PARTIAL OBSERVATION
Yaakov Yavin May 1982 26 p refs
(TWISK-266) Avail: NTIS HC A03/MF A01

Consider the random motion of two points in an open and bounded domain in the plane. Each of the velocities is perturbed by a corresponding Gaussian white noise. Two cases are dealt with: (1) each of the points can observe only its own location; (2) one can observe only its own location, but the other can observe the location of both points. The problem dealt with here is to find a strategy such that, in the sense of a Nash equilibrium point, the probabilities will both be maximized on a given class of (u,v)-admissible strategies. Sufficient conditions on weak optimal Nash equilibrium point strategies are derived, and weak suboptimal strategies computed for a variety of cases. Author

N83-21885# Societe Nationale Industrielle Aerospatiale, Cannes (France).
MINIMIZING UNOBSERVABILITY FOR LINEAR SYSTEMS WITH UNMEASURABLE PERIODIC DISTURBANCES
G. Alengrin (DNRS, Nice) and L. Passeron 1982 15 p refs

Presented at 6th IFAC Symp. on Identification and System Parameter Estimation, Washington, D.C., 7-11 Jun. 1982
(SNIAS-822-440-101) Avail: NTIS HC A02/MF A01

Linear systems excited by unmeasurable disturbances are very common in control systems. The state reconstruction of these systems via an augmented state vector leads in general to unobservability problems which must be overcome in order to build an observer. A geometric approach which avoids the computation of the observability matrix and gives a straightforward characterization of the unobservable subspace and an easy formulation for a canonical form for observability is developed. Then, assuming the a priori distribution of the disturbances to be known, an optimal canonical form for observability is derived in the sense that it minimizes the difference between the actual and estimate vector of the system. M.G.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N83-21886# Bristol Univ. (England). Dept. of Engineering Mathematics.
COUNTERSPIN NUTATION DAMPER ANALYSIS AND DESIGN
R. R. Clements, G. J. Reece, S. W. Tonkin (Tonkin Consultants), and J. H. Wright Paris ESA Aug. 1932 100 p refs
(Contract ESTEC-4795/81/NL-DK(SC))
(ESA-CR(P)-1647) Avail: NTIS HC A05/MF A01

A suitable counterspun nutation damping system was designed for IRIS, a combined spacecraft destined for geostationary orbit, and the perigee motor to put it into orbit after shuttle launch. A procedure is described for choosing a damper size, together with the number required, for any vehicle. For IRIS it is shown that two dampers, each with an angular momentum of 5 Nms, are sufficient, and that performance is adequate if one damper fails. Each damper would weigh just under 3 kg and require about 0.5 kg of batteries. The system can be operated immediately on ejection from the shuttle. Extensive computer simulations of damper performances show close agreement with predictions (for restricted cases) and reveal the effects of non-axisymmetry of the spacecraft, drive axle misalignment and Coulomb friction in the bearings. S.L.

N83-21887# European Space Agency, Paris (France).
TIME AND TIME DETERMINATION AT THE CNES
Nov. 1982 257 p refs Transl. into ENGLISH of "Le Temps et la Datation au CNES" CNES, Toulouse Proc. of Conf., Toulouse, 10-12 Mar. 1981 Original report in FRENCH announced as N82-22941
(ESA-TT-751) Avail: NTIS HC A12/MF A01

Different time scales (astronomical, atomic, universal,...) are presented and discussed. Their unification and utilization in space research was emphasized. Particular results relate to the general concept of time and its implications for theoretical physics. Practical results bear on clock synchronization and the dating of spaceborne remote sensing measurements. For individual titles, see N83-21888 through N83-21892.

N83-21888# European Space Agency, Paris (France).
THE CONCEPT OF TIME IN PHYSICS
Michel Avignon *In its* Time and Time Determination at the CNES (ESA-TT-751) Nov. 1982 p 4-64 refs Transl. into ENGLISH from "Le Temps et la Datation au CNES" CNES, Toulouse p 1-54 Original report in FRENCH announced as N82-22941 (For primary document see N83-21887 11-70)
Avail: NTIS HC A12/MF A01

The historical evolution of the concept of time in physics is surveyed. The shift from perceived (psychological) time to absolute time in classical mechanics as explained by Newton is considered. Newtonian absolute time is then compared to time in relative theory. The notion of simultaneity, restricted relatively, and Minkowski space-time are reviewed. This leads to time in thermodynamics and quantum mechanics. Statistical theories are discussed, including entropy gain and time tensors. The theory of time as an operator which measures the evolution of weakly stable systems is also mentioned. Author (ESA)

N83-21889# European Space Agency, Paris (France).
ASTRONOMERS' TIME
Jean-Louis Pieplu *In its* Time and Time Determination at the CNES (ESA-TT-751) Nov. 1982 p 65-106 refs Transl. into ENGLISH from "Le Temps et la Datation au CNES" CNES, Toulouse p 55-87 Original report in FRENCH announced as N82-22941 (For primary document see N83-21887 11-70)
Avail: NTIS HC A12/MF A01

The elaboration of astronomical time scales is discussed. Time in function of the rotation of the Earth is considered. Stellar time and sidereal time are compared. Time measurement by sidereal time is explained. Differences between mean solar time and sidereal time are pointed out. True solar time and a time equation are specified. Time in the function of planetary motions, irregularities in the rotation of the Earth, and universal time are also examined. Author (ESA)

N83-21890# European Space Agency, Paris (France).
TIME AND ATOMIC CLOCKS
Michel Brunet *In its* Time and Time Determination at the CNES (ESA-TT-751) Nov. 1982 p 107-152 Transl. into ENGLISH from "Le temps et la Datation CNES" CNES, Toulouse p 88-123 Original report in FRENCH announced as N82-22941 (For primary document see N83-21887 11-70)
Avail: NTIS HC A12/MF A01

Quartz clocks and atomic clocks are characterized and discussed. The general principle behind atomic standards is exposed, including the cesium jet, rubidium vapor, and hydrogen maser standards. Performances are compared for stability, exactitude, and reproducibility. Atomic time scales are then considered. The constitution of a clock is explained, relating to the International Atomic Time and Universal Time Coordinated scales. The role of the Bureau International de l'Heure is mentioned, especially as concerns French atomic time. Author (ESA)

N83-21891# European Space Agency, Paris (France).
THE DISTRIBUTION OF TIME AND SYNCHRONIZATION OF CLOCKS
Francois Nouel and Michel Brunet *In its* Time and Time Determination at the CNES (ESA-TT-751) Nov. 1982 p 153-216 refs Transl. into ENGLISH from "Le Temps et la Datation au CNES" CNES, Toulouse p 124-174 Original report in FRENCH announced as N82-22941 (For primary document see N83-21887 11-70)
Avail: NTIS HC A12/MF A01

Synchronization and relativity are discussed, emphasizing the role of time in space technology. Space-time is modeled mathematically and synchronization is defined. Synchronization by the physical displacement of a clock and by signal transmission are considered. A reference time common to all measurements is cited and measurement techniques are reviewed, especially satellite trajectory calculation. The Transit system and the Global Positioning System (NAVSTAR) are characterized as examples. Sychronization by Earth links and by space links are compared for performance. Author (ESA)

N83-21892# European Space Agency, Paris (France).
TELEMETRIC DETERMINATION OF TIME
Jean-Claude Vallat *In its* Time and Time Determination at the CNES (ESA-TT-751) Nov. 1982 p 217-256 refs Transl. into

ENGLISH from "Le Temps et la Datation au CNES" CNES, Toulouse p 176-206 Original report in FRENCH announced as N82-22941 (For primary document see N83-21887 11-70)
Avail: NTIS HC A12/MF A01

General principles of telemetry are surveyed and different methods of dating are reviewed, emphasizing spaceborne remote sensing applications. Onboard data multiplexing, signal transmission and reception, signal recording, and data processing (analog, PCM, PSK signals) are characterized. Time codes are discussed, i.e., PADTC, TRIG B and NASA 36, and TRIG A. Time readers are considered, including utilization, operating modes, and measured performance. Dating errors due to data analysis are identified. The necessity of onboard dating is seen; the SPOT dating scheme is cited as an example. Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N83-21893*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STABILIZED ACOUSTIC LEVITATION OF DENSE MATERIALS USING A HIGH-POWERED SIREN
Paul M. Gammell, Arvid Croonquist, and Taylor G. Wang 15 Dec. 1982 48 p refs
(NASA-CR-170124; NAS 1.26:170124; JPL-Publ-82-92) Avail: NTIS HC A03/MF A01 CSCL 20A

Stabilized acoustic levitation and manipulation of dense (e.g., steel) objects of 1 cm diameter, using a high powered siren, was demonstrated in trials that investigated the harmonic content and spatial distribution of the acoustic field, as well as the effect of sample position and reflector geometries on the acoustic field. Although further optimization is possible, the most stable operation achieved is expected to be adequate for most containerless processing applications. Best stability was obtained with an open reflector system, using a flat lower reflector and a slightly concave upper one. Operation slightly below resonance enhances stability as this minimizes the second harmonic, which is suspected of being a particularly destabilizing influence. Author

N83-21894*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
PROPAGATION OF SOUND THROUGH THE EARTH'S ATMOSPHERE Final Report, 1 Jul. 1982 - 31 May 1983
Roger W. Meredith and Jacob Becher 1983 15 p refs
(Grant NAG1-234)
(NASA-CR-170113; NAS 1.26:170113; PTR-83-2) Avail: NTIS HC A02/MF A01 CSCL 20A

The data collected at a pressure of one atmosphere for the different temperatures and relative humidities of the air-water vapor mixtures is summarized. The dew point hygrometer used in these measurements did not give reliable results for dew points much above the ambient room temperature. For this reasom measurements were not attempted at the higher temperatures and humidities. Viscous wall losses in the resonant tube at 0 C so dominate the molecular relaxation of nitrogen, in the air-water vapor mixture, that reliable data could not be obtained using the free decay method in a resonant tube at one atmosphere. In an effort to obtain viable data at these temperatures, measurements were performed at a pressure of 10 atmospheres. Since the molecular relaxation peak is proportional to the pressure and the viscous losses are proportional to the inverse square root of the pressure the peak height should be measurable at the higher pressure. The tradeoff here is that at 10 atmospheres; the highest relative humidity attainable is 10 percent. The data collected at 10 atmospheres is also summarized. S.L.

N83-21895*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FARFIELD INFLIGHT MEASUREMENT OF HIGH-SPEED TURBOPROP NOISE
Joseph R. Balombin and Irvin J. Loeffler [1982] 19 p refs Presented at the AIAA 8th Aeroacoustics Conf., Atlanta, 11-13 Apr. 1983
(NASA-TM-83327; E-1574; NAS 1.15:83327; AIAA-83-9745) Avail: NTIS HC A02/MF A01 CSCL 20A

A flight program was carried out to determine the variation of noise level with distance from a model high speed propeller. Noise measurements were obtained at different distances from a SR-3 propeller mounted on a JetStar aircraft, with the test instrumentation mounted on a Lear jet flown in formation. The propeller was operated at 0.8 flight Mach number, 1.12 helical tip Mach number and at 0.7 flight Mach number, 1.0 helical tip Mach number. The instantaneous pressure from individual blades was observed to rise faster at the 0.8 M flight speed, than at the 0.7 M flight speed. The measured levels appeared to decrease in good agreement with a 6 dB/doubling of distance decay, over the measurement range of approximately 16 m to 100 m distance. Further extrapolation, to the distances represented by a community, would suggest that the propagated levels during cruise would not cause a serious community annoyance. Author

N83-21896*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC MODAL ANALYSIS OF A FULL-SCALE ANNULAR COMBUSTOR
Allen M. Karchner [1982] 18 p refs Presented at the AIAA 8th Aeroacoustics Conf., Atlanta, 11-13 Apr. 1983
(NASA-TM-83334; E-1581; NAS 1.15:83334; AIAA-83-0760) Avail: NTIS HC A02/MF A01 CSCL 20A

An acoustic modal decomposition of the measured pressure field in a full scale annular combustor installed in a ducted test rig is described. The modal analysis, utilizing a least squares optimization routine, is facilitated by the assumption of randomly occurring pressure disturbances which generate equal amplitude clockwise and counter-clockwise pressure waves, and the assumption of statistical independence between modes. These assumptions are fully justified by the measured cross spectral phases between the various measurement points. The resultant modal decomposition indicates that higher order modes compose the dominant portion of the combustor pressure spectrum in the range of frequencies of interest in core noise studies. A second major finding is that, over the frequency range of interest, each individual mode which is present exists in virtual isolation over significant portions of the spectrum. Finally, a comparison between the present results and a limited amount of data obtained in an operating turbofan engine with the same combustor is made. The comparison is sufficiently favorable to warrant the conclusion that the structure of the combustor pressure field is preserved between the component facility and the engine. Author

N83-21897*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT DIFFERENCE SOLUTIONS OF THE INHOMOGENEOUS WAVE EQUATION: SIMULATION OF THE GREEN'S FUNCTION
Kenneth J. Baumeiste 1983 13 p refs Presented at 8th Aeroacoust. Conf., Atlanta, 11-13 Apr. 1983; sponsored by AIAA
(NASA-TM-83336; E-1586; NAS 1.15:83336) Avail: NTIS HC A02/MF A01 CSCL 20A

A time-dependent finite difference formulation to the inhomogeneous wave equation is derived for plane wave propagation with harmonic noise sources. The difference equation and boundary conditions are developed along with the techniques to simulate the Dirac delta function associated with a concentrated noise source. Example calculations are presented for the Green's function and distributed noise sources. For the example considered, the desired Fourier transformed acoustic pressures are determined from the transient pressures by use of a ramping function and an integration technique, both of which eliminates the nonharmonic pressure associated with the initial transient. Author

N83-21898# Vereins zur Foerderung von Forschungs- und Entnicklungsarbeiten in der Werkzeugindustrie e.V., Remscheid (West Germany).
NOISE REDUCTION OF CIRCULAR SAWING MACHINES, INFLUENCE OF TOOTH SHAPE AND NUMBER OF TEETH Final Report, Apr. 1980
Helmut Huber and Uwe Volker Muenz Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 98 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-008; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

While cutting, circular sawing machines create a noise level of 97 to 106 dB(A). The tooth geometry and the dimensions of a silent saw are investigated as well as noise damping measurements on the machines. After alteration of tools and machines the noise level measurements were performed. By decrease of tooth height and number of teeth and by damping of machine parts, noise level reductions of about 10 dB(A) were achieved. S.L.

N83-21899# Ames Lab., Iowa.
ACOUSTIC IMAGING WITH TWO-DIMENSIONAL ARRAYS
K. M. Lakin and A. R. Landin 1981 13 p refs Presented at the DARPA/AFML Rev. of Quantitative NDE, Boulder, Colo., 2-7 Aug. 1981
(Contract W-7405-eng-82)
(DE82-014363; IS-M-369; CONF-810839-16) Avail: NTIS HC A02/MF A01

This paper reports on progress in the last three years in the study of acoustic imaging with two dimensional array concepts using coherent wave reconstruction techniques. Both experimental and theoretical aspects of the problem were investigated. The theoretical effort has addressed the problems of small angle reconstruction on planes parallel and perpendicular to the measurement plane; imaging through a refracting surface, such as water/metal; and anisotropy in the host material. The latter problem has recently been approached as a two dimensional deconvolution inversion of the spatial form of the scattered fields. In this case the Green's function of the system must be known at the location of the flaw and for the particular ray paths involved. Based upon an analysis of the low frequency response of a flaw, a technique has been found for determining the Green's function of the system that accounts for anisotropy and refraction effects. DOE

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N83-21900# British Library Lending Div., Boston Spa (England).
ANGULAR CORRELATIONS OF ATOMS IN SIMPLE LIQUIDS AND QUASI-CRYSTALLINE MODELS OF A LIQUID METAL
D. K. Belashchenko 13 Dec. 1982 10 p refs Transl. into ENGLISH from Stal (USSR), v. 11, 1981 p 42-44
(BLL-M-26816-(5828.4)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The angular correlations of atoms in liquids are discussed and it is verified from experimental data that the concepts of atom packings of the b.c.c. or f.c.c. type are meaningful in their application to simple liquids. Author

N83-21901# Oxford Univ. (England). Dept. of Engineering.
TRITIUM ISOTOPE SEPARATION USING RESONANCE RADIATION
P. C. Stangeby (Toronto Univ.) Aug. 1982 46 p refs
(OUEL-1429/82) Avail: NTIS HC A03/MF A01

A method for separating hydrogen isotopes - particularly directed at tritium from deuterium is outlined. The method involves no fundamental scientific or technological developments but requires significant R & D in a number of subareas in order to establish the engineering and economic feasibility of the approach. The hardware required is of a simple, robusting long lived variety, i.e., electrical discharges, gas pumping units, etc. The system is comparatively easy to maintain. The concept is analyzed in the content of hydrogenic isotope separation. S.L.

N83-21902*# National Aeronautics and Space Administration, Washington, D. C.
ON THE METHOD OF POSITRON LIFETIME MEASUREMENT
Fumitaka Nishiyama, Kyoshi Shizuma, Hiromi Nasai, and Masato Nishi Jan. 1983 23 p refs Transl. into ENGLISH from Hiroshima Daigaku, Kogakubu Kenkyu Hoioku (Japan), v. 29, no. 2, Mar. 1981 p 149-158 Presented to the Japan Assoc. of Phys. and Shikoku Branch of the Appl. Phys. Assoc., Okayama, Japan, Jul. 1980 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77018; NAS 1.15:77018) Avail: NTIS HC A02/MF A01 CSCL 20H

A fast-slow coincidence system was constructed for the measurement of positron lifetimes in material. The time resolution of this system was 270 ps for the (60)Co gamma rays. Positron lifetime spectra for 14 kinds of alkali halides were measured with this system. Two lifetime components and their intensities were derived from analyses of the lifetime spectra. M.G.

N83-21903*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RING-CUSP ION THRUSTER WITH SHELL ANODE Patent Application
James S. Sovey, Vincent K. Rawlin, and Robert F. Roman, inventors (to NASA) Filed 9 Mar. 1983 12 p
(NASA-Case-LEW-13881-1; US-Patent-Appl-SN-473498) Avail: NTIS HC A02/MF A01 CSCL 20H

An ion thruster for low specific impulse operation in the 1500 sec to 6000 sec range has a multicusp boundary field provided by high strength magnets on an iron anode shell which lengthens the paths of electrons from a hollow cathode assembly. A downstream anode pole piece in the form of an iron ring supports a ring of magnets to provide a more uniform beam profile. A cylindrical cathode magnet can be moved selectively in an axial direction along a feed tube to produce the desired magnetic field at the cathode tip. NASA

N83-21904# Cornell Univ., Ithaca, N. Y.
INTERACTION OF HIGH RESOLUTION FIELD ION PROBES WITH MATERIALS
Benjamin M. Siegel 12 Nov. 1981 48 p refs
(Contract N00014-80-C-0587; ARPA Order 3954)
(AD-A122531; TR-1) Avail: NTIS HC A03/MF A01 CSCL 20/7

Ion beam lithography (IBL) can be expected to have significant advantages over electron beam lithography (EBL). The ions deposit much more energy per charged particle and thus resists are typically 50-100 times more sensitive to ions than to electrons. Also the range of the ions is well defined by their incident energy and there is no backscattering that causes the proximity effects which are a serious limitation in electron beam lithography. This means that very high resolution configurations could be structured by direct write ion beam lithography using single resist layers on thick substrates. It is our task to develop the instrumentation required to produce high resolution, high current density probes that could be used to investigate the interactions of ions with resists and substrate materials, evaluate the potential and feasibility of ion beam lithography and produce structures and devices with dimensions in the range of 10 to 100 nm. Our approach and the instrumental developments that we have made are based on the use of the H2+ gaseous field ion source that we have developed. This source represents an important breakthrough in providing a very high brightness ion beam of low mass ions, H2+, with high angular current density and low energy spread. GRA

N83-21905# SRI International Corp., Menlo Park, Calif.
STUDY OF METASTABLE RARE GAS COLLISIONS WITH

MOLECULES Final Report, Jul. 1976 - Aug. 1982
Keith T. Gillen 4 Dec. 1982 82 p refs
(Contract N00014-76-C-0734)
(AD-A122544; SRI-MP-82-133) Avail: NTIS HC A05/MF A01 CSCL 20/8

This report summarizes an experimental and computer-modeling investigation of reactive and inelastic scattering of fast metastable rare gas atoms (He* (21S), He* (23S), and Ar*) by O2 and I2 target molecules. Similarities to (and difference from) analogous alkali atom interactions with halogen and oxygen molecules were probed. Processes investigated and characterized included ion-pair formation, ion-pair mediated vibrational excitation, and Penning ionization. Coincidence techniques were developed that allowed the first double-differential cross section measurements of a Penning process in a triatomic system. Author (GRA)

N83-21906# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
INVERSION OF SPECTRAL LINESHAPES TO YIELD COLLISION RATE CONSTANTS Annual Status Report
J. Gelfand, H. Rabitz, and R. B. Miles 10 Jul. 1982 17 p refs
(Contract N00014-78-C-0721)
(AD-A122357; ASP-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

State-to-state collisional energy transfer rates are being obtained by the inversion of pressure broadened linewidth data. Measurements of linewidths in overtone vibration-rotation transitions have yielded information on rotationally elastic and inelastic collision rates for vibrationally excited HCl, HF, and CO. Similar information is being acquired for vibrationally excited DF. Work is continuing in evaluating the energy corrected sudden scaling theory. Author (GRA)

N83-21907# Harry Diamond Labs., Adelphi, Md.
HIGH-POWER MICROWAVE SOURCE REQUIREMENTS FOR A RELATIVISTIC ELECTRON ACCELERATOR
Howard E. Brandt Oct. 1982 22 p refs
(AD-A122316; HDL-SR-82-7) Avail: NTIS HC A02/MF A01 CSCL 20/7

An estimate is made of the high-power microwave source intensity required to drive a relativistic electron accelerator of the type proposed some time ago by A. A. Kolomenskii and A. N. Lebedev. In this acceleration method, an external static magnetic guide field is chosen such that the particles are steered in such a way that the electric field of the microwave source performs positive work on them on the average. This calculation is intended only to provide a point of reference for this and other types of high-power microwave driven electron accelerators. Although the required intensity for the above approach exceeds present capabilities, intensive research in the development of new high-power microwave sources may change this. Author (GRA)

N83-21908# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PARTICLE DYNAMICS IN LINEAR RESONANCE ACCELERATORS
I. M. Kapchinskiy 8 Nov. 1982 585 p refs Transl. into ENGLISH of Mono. "Dinamika Chastits v Lineynykh Rezonansnykh Uskoritelyakh" Moscow, 1966 p 1-310
(AD-A122802; FTD-ID(RS)T-1052-82) Avail: NTIS HC A25/MF A01 CSCL 20/8

The longitudinal and transverse vibrations of particles in beams with negative and high density space charge are discussed. GRA

N83-21909# California Univ., Livermore. Lawrence Livermore Lab.
MFE/ACT: A TRS-80 CODE FOR CALCULATING NEUTRON ACTIVATION
D. W. Dorn Oct. 1982 20 p refs
(Contract W-7405-eng-48)
(DE83-004324; UCID-19415) Avail: NTIS HC A02/MF A01

The MFE/ACT code, written to run on the TRS-80, can be used to calculate the neutron activation of materials used in fission and fusion reactors. Input data include the specific isotopes to be calculated, the neutron fluxes, the neutron cross sections, and the nuclear decay half-lives. DOE

N83-21910# California Univ., Berkeley. Div. of Materials and Molecular Research.
SUPERSONIC MOLECULAR BEAM ELECTRIC RESONANCE SPECTROSCOPY AND VER DER WAALS MOLECULES Ph.D. Thesis
Henry Steven Loftman Sep. 1982 368 p refs
(Contract DE-AC03-76SF-00098)
(DE83-003303; LBL-15091) Avail: NTIS HC A16/MF A01

A supersonic molecular beam electric resonance (MBER) spectrometer was built to study the radio frequency spectra of weakly bound gas phase van der Waals molecules. The instrument and its operating characteristics are described in detail. Sample mass spectra of Ar-C1F gas mixtures are also presented as an illustration of the synthesis of van der Waals molecules. The Stark focusing process for linear polar molecules is discussed and computer-simulated using both second order perturbation and variational methods. Experimental refocusing spectra of OCS and C1F are studied and compared with these trajectory calculations. Though quantitative fitting is poor, there are strong qualitative indicators that the central part of a supersonic beam consists of molecules with a significantly greater population in the lowest energy rotational states than generally assumed. The theoretical properties of the MBER spectrum for linear molecules are elaborated upon with special emphasis on line shape considerations. Finally, an electrostatic potential model is used to quantitatively describe the class of van der Waals molecules Ar-MX, where MX is an alkali halide. Energetics and equilibrium geometries are calculated. The validity of using an electrostatic model to predict van der Waals bond properties is critically discussed. DOE

N83-21911# Brookhaven National Lab., Upton, N. Y.
SINGLE-BEAM COHERENT INSTABILITIES IN CIRCULAR ACCELERATORS AND STORAGE RINGS
C. Pellegrini Apr. 1982 70 p refs
(Contract DE-AC02-76CH-00016)
(DE83-000792; BNL-51538) Avail: NTIS HC A04/MF A01

The theory of the stability of high intensity particle beams in circular accelerators and storage rings is developed. A simple one dimensional oscillator system is used to introduce the discussion of the stability problem and of the effect of a frequency distribution. These results are then extended to the case of a system of particles executing synchrotron and betatron oscillations in a circular accelerator. In the absence of a general solution of the stability problems, it is convenient to introduce a classification of the instabilities, using the characteristic times and lengths of the particle system. This allows us to identify a set of parameters of the particle beam for which one can establish the stability conditions. DOE

N83-21912# New Hampshire Univ., Durham.
NUCLEAR-STRUCTURE INVESTIGATIONS ON SPHERICAL NUCLEI
J. Heisenberg, J. Dawson, and J. Calarco 1982 34 p refs
(Contract DE-AC02-79ER-10338)
(DE83-000996; DOE/ER-10338/T1) Avail: NTIS HC A03/MF A01

Nuclear structure research at the University of New Hampshire is reported. Energy level studies using electron inelastic scattering and electron-induced fission are briefly discussed. Also, the theoretical studies are outlined including exchange current calculations, shell model RPA calculations, and self-consistent RPA. Publications are listed. DOE

N83-21913# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
FIELD-ION MICROSCOPY
David N. Seidman Mar. 1982 14 p refs
(Contract DE-AS02-76ER-03158)
(DE82-013919; DOE/ER-03518/103; MSC-4691) Avail: NTIS

HC A02/MF A01

This short article discusses the elements of a basic field ion microscope (FIM), the physics of the processes of field ionization and field evaporation, the factors limiting atomic resolution, the principle features of an atom probe FIM and imaging atom probe mass spectroscopy. DOE

N83-21914# Los Alamos Scientific Lab., N. Mex.
SOLUTION OF THE FOKKER-PLANCK EQUATION FOR CHARGED PARTICLE TRANSPORT IN ONE SPACE DIMENSION
T. A. Oliphant and A. Andrade 1982 29 p refs Presented at Los Alamos/CEA Conf., Paris, 19 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014047; LA-UR-82-1045; CONF-820429-7) Avail: NTIS HC A03/MF A01

Numerical techniques for solving the Fokker-Planck equation have been developed which closely parallel those used in neutron transport. This was a natural step since the theory and methods of neutron transport have been well developed. Moreover a line of treatment has been developed tailored to the specific requirements of transport in mirror machines. This approach involves the assumption that the distribution function remain constant along a guiding center orbit. Diffusion techniques have been developed in which sequential moments of the transport equation are taken so as to generate a set of coupled equations. Here a method is developed which treats the transport operator according to the standard diamond differencing techniques of neutron transport, but treats the collision term by a method designed to take advantage of the form of the Fokker-Planck collision operator. DOE

N83-21915# Hanford Engineering Development Lab., Richland, Wash.
DAMAGE ANALYSIS AND FUNDAMENTAL STUDIES
Peter Wilkes, Frank Nolfi, and John Spitznagel Feb. 1982 182 p refs Proc. of a Workshop on Advan. Tech. for Radiation Damage Anal., Oak Ridge, Ill., 8-9 Mar. 1979 2 Vol.
(Contract DE-AC06-76FF-02170)
(DE82-013569; DOE/ER-0046/8-Vol-2; CONF-790391-Vol-2) Avail: NTIS HC A09/MF A01

The usefulness of a variety of sophisticated techniques available in analysis of radiation damage microstructures was assessed. The fusion materials program requires careful analysis of large numbers of irradiated samples. The problem is exacerbated by the absence of any high dose rate, 14 MeV neutron facility. This places great demands on predictions from other neutron sources and, in turn, requires a very complete understanding of the fundamental processes occurring in void swelling, radiation phase instability, radiation creep, fatigue, and fracture. Therefore, it is necessary to make appropriate use of every technique that can provide useful information on relevant microstructural features and, in addition, to explore the possibilities of using technically trained people to maximum efficiency by means of innovative data collection systems. Developments in the techniques of radiation damage microstructure are presented. DOE

N83-21916# Los Alamos Scientific Lab., N. Mex.
SPIN OBSERVABLES IN NUCLEON-NUCLEUS SCATTERING
J. M. Moss 1982 18 p refs Presented at the Intern. Conf. on Spin Excitations in Nuclei, Telluride, Colo., 25-27 Mar. 1982
(Contract W-7405-eng-36)
(DE82-014079; LA-UR-82-1018; CONF-820357-3) Avail: NTIS HC A02/MF A01

The curse of inelastic nucleon scattering and charge exchange is the enormous complexity of the nucleon-nucleon (N-N) interaction. This complexity, however, can also be viewed as the ultimate promise of nucleons as probes of nuclear structure. Given an adequate theoretical basis, inelastic nucleon scattering is capable of providing information not obtainable with other probes. A revolution of experimental technique makes it desirable to re-examine the question of what phusics is ultimately obtainable from inelastic nucleon scattering. It is now feasible to perform complete polarization transfer (PT) experiments for inelastic proton scattering with high efficiency and excellent energy resolution. Programs to measure PT observables are underway at several laboratories, and results are beginning to appear. How such experiments are done, what physics is presently obtained, and may ultimately be learned from them are examined. DOE

N83-21917# California Univ., Livermore. Lawrence Livermore Lab.
CURRENT STATUS OF FAST-NEUTRON-CAPTURE CALCULATIONS
Donald G. Gardner 15 Apr. 1982 49 p refs Presented at the NEANDC/NEACRP Specialists Meeting on Fast-Neutron Capture Cross Sections, Argonne, Ill., 20-23 Apr. 1982
(Contract W-7405-eng-48)
(DE82-016013; UCRL-87438; CONF-820438-3) Avail: NTIS HC A03/MF A01

Neutron capture cross sections and capture gamma ray spectra, in the framework of the Hauser-Feshbach statistical model and neutrons from the resonance region up to several MeV are studied. An argument is made that, for applied purposes such as constructing evaluated cross section libraries, nonstatistical capture mechanisms may be completely neglected at low energies and adequately approximated at high energies in a simple way. The use of gamma ray strength functions to obtain radiation widths is emphasized. Using the reaction Y-89 + n as an example, the problems encountered in trying to construct a case that could be run equivalently on two different nuclear reaction codes are illustrated, and the effects produced by certain parameter variations are discussed. DOE

N83-21918# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
DROPLET-MODEL PREDICTIONS OF CHARGE MOMENTS
William D. Myers Apr. 1982 21 p refs Presented at the Conf. on Lasers in Nucl. Phys., Oak Ridge, Tenn., 21-23 Apr. 1982
(Contract DE-AC03-76SF-00098)
(DE82-014995; LBL-14310; CONF-820428-6) Avail: NTIS HC A02/MF A01

The droplet model expressions for calculating various moments of the nuclear charge distribution are given. There are contributions to the moments from the size and shape of the system, from the internal redistribution induced by the Coulomb repulsion, and from the diffuseness of the surface. A case is made for the use of diffuse charge distributions generated by convolution as an alternative to Fermi functions. DOE

N83-21919# Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (West Germany).
NUCLEAR DISINTEGRATION IN RELATIVISTIC HEAVY-ION COLLISIONS
Hans H. Gutbrod, A. I. Warwick, and H. Wieman Apr. 1982 17 p refs Presented at the Intern. Conf. on Selected Heavy Ion Reactions, Saclay, France, 3 May 1982 Prepared in cooperation with California Univ., Berkeley, Lawrence Berkeley Lab.
(Contracts W-7405-eng-48; DE-AC03-76SF-00098)
(DE82-015705; LBL-14371; CONF-820536-3) Avail: NTIS HC A02/MF A01

The breakdown of the participant spectator model for central relativistic nuclear collisions is discussed and a different picture of a hot spot followed by a target explosion is suggested to be more consistent with the data. DOE

N83-21920# Los Alamos Scientific Lab., N. Mex.
UNCONDITIONALLY STABLE DIFFUSION-ACCELERATION OF THE TRANSPORT EQUATION
Edward W. Larsen 1982 22 p refs Presented at the Los Alamos/CEA Appl. Phys. Conf., Paris, 19-23 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014064; LA-UR-82-971; CONF-820429-11) Avail: NTIS HC A02/MF A01

The standard iterative procedure for solving fixed-source discrete-ordinates problems converges very slowly for problems in

optically large regions with scattering ratios c near unity. The diffusion-synthetic acceleration method was proposed to make use of the fact that for this class of problems the diffusion equation is often an accurate approximation to the transport equation. However, stability difficulties historically hampered the implementation of this method for general transport differencing schemes. A procedure for obtaining unconditionally stable diffusion-synthetic acceleration methods for various transport differencing schemes is discussed. The procedure is illustrated by deriving a new stable acceleration method for the linear discontinuous transport differencing scheme. Some numerical results are provided. DOE

N83-21921# Ames Lab., Iowa.
EIKONAL APPROXIMATION IN ELASTIC-WAVE-SCATTERING THEORY
James H. Rose and B. DeFacio (Missouri Univ.) 1981 11 p refs Presented at the AF/DARPA Rev. of Progress in Quantitative NDE, Boulder, Colo., 2-7 Aug. 1981
(Contract W-7405-eng-82)
(DE82-014320; IS-M-371; CONF-810839-15) Avail: NTIS HC A02/MF A01

The Eikonal approximation to the elastic wave equation is studied. This approximation, which uses a time domain picture to include variations in the local velocity of sound, is appropriate in two different cases: (1) weak scattering at all frequencies; and (2) strong and weak scattering at sufficiently high frequencies. The primary result is a new weak scattering approximation which is superior to the Born (Newmann) approximation in this limit. A total of three Eikonal approximations are introduced. All three approximations presented have a richer frequency dependence than the Born-Neumann result. Furthermore, unlike the Born-Neumann theory, the scattering amplitude is complex (as it must be) for flaws with a center of inversion symmetry. Numerical results are presented to test the approximations. The possibility of extending the results via variational theorems and the use of the Eikonal approximation when there are multiple flaws is discussed. DOE

N83-21922# Los Alamos Scientific Lab., N. Mex.
SPIN EXCITATIONS IN PION INELASTIC SCATTERING
S. J. Seestrom-Morris, D. B. Holtkamp, and W. B. Cottingame 1982 20 p refs Presented at Intern. Conf. on Spin Excitations in Nuclei, Telluride, Colo., 25 Mar. 1982
(Contract W-7405-eng-36)
(DE82-012168; LA-UR-82-854; CONF-820357-1) Avail: NTIS HC A02/MF A01

The data on spin excitations observed in pion inelastic scattering are reviewed. A predominant feature of this process is the selectivity with which high-spin unnatural-parity states are excited. Constant-q excitation functions have proven valuable in identifying unnatural-parity states because of the unique signature of delta S = 1 transitions. It has recently been shown that angular distributions measured for transitions to natural-parity states are quite different for delta S = 0 and delta S = 1 transitions. Pion scattering should continue to prove useful in studying the spin structure of nuclear transitions because of the sensitivity of both excitation functions and angular distributions to the spin transferred to the nucleus. In particular, pion scattering measurements may be helpful in searches for spin-mode giant resonances. In addition to the ability to distinguish transitions dominated by delta S = 1, comparisons of pi+ and pi- scattering can be used to determine the relative contributions of neutrons and protons to inelastic transitions. DOE

N83-21923# Brookhaven National Lab., Upton, N. Y. Physics Dept.
MONTE CARLO COMPUTATIONS OF THE HADRONIC MASS SPECTRUM
C. Rebbi 1982 15 p refs Presented at the 19th Orbis Sci. Meeting, Coral Gables, Fla., 18-21 Jan. 1982
(Contract DE-AC02-76CH-00016)
(DE82-014012; BNL-31234; CONF-820142-3) Avail: NTIS HC A02/MF A01

Monte Carlo results on the mass gap (or glueball mass) and on the masses of the lightest quark model hadrons are illustrated. DOE

N83-21924# Academia Sinica, Nankang, Taipei (Taiwan). Inst. of Physics.
AN OPERATOR APPROACH TO THE STRONG COUPLING TRANSMUTATION OF A YUKAWA INTERACTION
C. C. Chiang, C. B. Chiu (Texas Univ., Austin), E. C. G. Sudarshan (Texas Univ., Austin), and Xerxes Tata (Texas Univ., Austin) Jan. 1982 20 p refs
(Contract DE-AS05-76ER-03992)
(DE82-013895; DOE/ER-03992/474) Avail: NTIS HC A02/MF A01

It is shown that the transmutation mechanism introduced in earlier papers is both necessary and sufficient to ensure the equivalence of the Lee model and the attractive separable potential model in all sectors when the bare coupling constant of the Lee model is taken to infinity. It is demonstrated that the Hamiltonian operator for the Lee model reduces to that for the separable potential. It is further demonstrated that in the same limit the finite energy eigenfunctions, and hence the scattering amplitudes and the S-matrix calculated from the two theories coincide in all sectors. DOE

N83-21925# South Carolina Univ., Columbia. Dept. of Physics and Astronomy.
HIGH RESOLUTION POSITRON Q-VALUE MEASUREMENTS AND NUCLEAR STRUCTURE STUDIES FAR FROM THE STABILITY LINE Progress Report
Frank T. Avignone, III 28 Feb. 1982 102 p refs
(Contract DE-AS09-79ER-10434)
(DE82-013242; DOE/ER-10434/3) Avail: NTIS HC A06/MF A01

Research progress is described, and details are presented: (1) precision mass differences in light rubidium and krypton isotopes utilizing beta endpoint measurements; (2) precision mass measurements utilizing beta endpoints; (3) Monte Carlo calculations predicting the response of intrinsic GE detectors to electrons and positrons; and (4) reactor antineutrino spectra and nuclear spectroscopy of isotopes far from beta stability. DOE

N83-21926# Oak Ridge National Lab., Tenn.
MULTIPHOTON IONIZATION OF ATOMS AND MOLECULES
R. N. Compton and John C. Miller 1982 13 p refs Presented at the Topical Meeting of Optical Soc. of Am. on Laser Tech. for Extreme Ultraviolet Spectry., Boulder, Colo., 8-10 Mar. 1982 Submitted for publication
(Contract W-7405-eng-26)
(DE82-008834; CONF-820336-1) Avail: NTIS HC A02/MF A01

Resonantly enhanced multiphoton ionization of alkali atoms, rare gases, and small molecules was studied using tightly focused dye laser beams. The gas densities for most species were varied over the range from 10 to the -7 power torr to 100 torr. In the case of alkali atoms, some ionization signals appear as a result of gas density effects (dimers or quasi-collisions). These are termed hybrid resonances. By contrast, in the case of the rare gases, certain resonance ionization signals disappear with increasing gas density. At low pressure mass spectra, kinetic energy released in ionic fragmentation, and photoelectron kinetic energy spectra were studied. These experiments, combined with two color dye laser experiments, can offer an unambiguous and detailed description of the multiphoton ionization and subsequent fragmentation events. DOE

N83-21927# Waterloo Univ. (Ontario). Dept. of Physics.
DYNAMICAL STUDIES OF EXCITED STATES IN TRIATOMIC MOLECULES
Wing-Ki Liu, D. W. Noid (ORNL), and M. L. Koszykowski (Sandia National Lab., Livermore, Calif.) 1982 22 p refs Presented at the 15th Jerusalem Symp. in Quantum Chem. and Biochem., Jerusalem, 5 Apr. 1982
(Contract W-7405-eng-26)
(DE82-013453; CONF-820446-1) Avail: NTIS HC A02/MF A01

A numerical study on the spectra of the vibrational motion of the isotopic species of water molecule is performed. At low energy the classical motion is quasiperiodic and the spectra show well resolved lines whose frequencies can be identified with the transition frequencies between vibrational states. As energy is increased, the motion becomes chaotic and the spectra are broadened. The effects of isotopic substitution are investigated. Freezing the bending mode affects the motion considerably. A cross correlation function is introduced and its spectra features studied. DOE

N83-21928# Brookhaven National Lab., Upton, N. Y.
MOLECULAR STRUCTURE MEASUREMENTS OF SWIFT COMPLEX IONS TRAVERSING THIN CARBON FOILS
H. E. Wegner 1982 20 p refs Presented at Conf. on Charge States and Dynamic Screening of Swift Ions, Honolulu, Hawaii, 25 Jan. 1982
(Contract DE-AC02-76CH-00016)
(DE82-009923; BNL-31013; CONF-820131-2) Avail: NTIS HC A02/MF A01

The final data and analysis of the Coulomb explosion of two molecular systems, C3(+0-) and NCO(+0-), each measured in the positive, neutral and negative charge state are reported. In addition, a measurement was made with the CH2(+) ion and preliminary results are reported. Analysis of the three C3(+0-) species showed them all to have the same intranuclear separation found in normal neutral C3; 2.5(a)A, and similarly for the three NCO(+0-) species, except that the separation was rather small; 2.0(1)A. Preliminary analysis of the CH2(+) data indicates that the best fit included angle, alpha sub i, between the two hydrogen atoms is 122 deg (3) with an average absolute deviation angle from equilibrium, delta alpa sub i, of 23 deg (2) for a molecular model with linear uniform oscillation, and alpha sub i, = 126 deg (3), delta alpha sub i = 19 deg (2), for a model with simple harmonic oscillation. These preliminary values compare well with the measured value of 115 deg for neutral CH2. DOE

N83-21929# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
STATISTICS OF THE ATOM-BY-ATOM DISSECTION OF PLANES IN AN ATOM-PROBE FIELD-ION MICROSCOPE: THE NUMBER OF ATOMS DETECTED PER PLANE
Albert T. Macrander (Bell Telephone Labs., Inc., Murray Hill, N.J.), Masahiko Yamamoto (Osaka Univ., Japan), and David N. Seidman Jun. 1982 30 p refs Sponsored in part by NSF
(Contract DE-AC02-76ER-03158)
(DE83-001366; DOE/ER-03158/101; MSC-4686) Avail: NTIS HC A03/MF A01

Tungsten specimens oriented in the [110] direction, with the probe hole over the center of the plane, were slowly pulse field-evaporated on a plane-by-plane basis, and statistical analyses were made on the number of tungsten atoms detected per plane. Twenty-four separate slow dissection experiments were performed. Observed fluctuations in the number of atoms per plane are used to infer a range of allowable values for the detection efficiency. DOE

N83-21930# California Univ., Livermore. Lawrence Livermore Lab.
SUMMARY OF MEASUREMENTS AND CALCULATIONS OF NEUTRON AND GAMMA-RAY EMISSION SPECTRA FROM SPHERES PULSED WITH 14-MeV NEUTRONS
L. F. Hansen, T. T. Komoto, B. A. Pohl, and C. Wong Nov. 1982 14 p refs
(Contract W-7405-eng-48)
(DE83-004450; UCID-19604) Avail: NTIS HC A02/MF A01

A tabulation of the spherical assemblies for which the transport of 14 MeV neutrons have been measured using pulsed sphere and time of flight techniques is presented. The description of the measurements and their comparison with the predictions of Monte Carlo calculations using the ENDL and ENDF (III to V versions) libraries can be found in the publications listed in the refsrences. DOE

N83-21931# Arizona Univ., Tucson. Optical Sciences Center.
RESEARCH DIRECTED AT DEVELOPING A CLASSICAL THEORY TO DESCRIBE ISOTOPE SEPARATION OF POLYATOMIC MOLECULES ILLUMINATED BY INTENSE INFRARED RADIATION Final Report, 7 May - 30 Sep. 1979
Willis E. Lamb, Jr. Dec. 1981 10 p
(Contract DE-AC02-77ET-33011)
(DE83-002176; DOE/ET-33011/T2) Avail: NTIS HC A02/MF A01

The theory of isotope separation produced by the illumination of polyatomic molecules by intense infrared laser radiation was studied. This process is investigated by treating the molecule, sulfur hexafluoride, as a system of seven classical particles that obey the Newtonian equations of motion. A minicomputer is used to integrate these differential equations. The particles are acted on by interatomic forces, and by the time dependent electric field of the laser. The interaction of the laser and the molecule which is compatible with infrared absorption and spectroscopic data was expressed satisfactorily. Computer runs of the dynamical behavior of the molecule were made using a reasonably good model for the interatomic force law. For the laser parameters chosen, the molecule passes quickly through the resonance region into the quasi-continuum and even well into the real continuum before dissociation actually occurs. When viewed on a display terminal, the motions are exceedingly complex. DOE

N83-21932# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Physics.
FLUORESCENT SCATTERING BY MOLECULES EMBEDDED IN SMALL PARTICLES
1982 76 p refs
(DE83-001370; DOE/EV-04361/T3) Avail: NTIS HC A05/MF A01

Studies are reported in these areas: double resonance in fluorescent and Raman scattering; surface enhanced Raman scattering; fluorescence by molecules embedded in small particles; fluorescence by a liquid droplet; and fluorescence by conical pits in surfaces. DOE

N83-21933# Chicago Univ., Ill. Dept. of Physics.
STUDIES OF ISOTROPIC EFFECTS IN THE EXCITED ELECTRONIC STATES OF MOLECULAR SYSTEMS
1982 9 p refs
(DE83-001795; DOE/ET-33065/T1) Avail: NTIS HC A02/MF A01

Rare gas halogen (RGH) lasers serve as convenient tools for a range of photophysical processes which exhibit isotope effects. Progress in the production of molecular systems in their electronic excited states with the aid of RGH lasers, and the various isotopic effects one can study under these conditions is summarized. It is concluded that the basic physical mechanisms involved in the isotopically sensitive characteristics of excited molecular electronic states are sufficiently selective to be useful in both the detection and separation of many atomic materials. DOE

N83-21934# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Atomic Energy Div.
RADIOISOTOPES FOR HEAT-SOURCE APPLICATIONS
J. E. Hoisington 6 Oct. 1982 14 p refs
(Contract DE-AC09-76SR-00001)
(DE83-005045; DPST-82-842) Avail: NTIS HC A02/MF A01

Potential DOD requirements for noninterruptable power sources could total 1 MW thermal by FY 1990. Of the three isotopes considered, Sr-90, Pm-147, Pu-238, Sr-90 is the only one available in sufficient amounts to meet this requirement. To meet the DOD FY 1990 requirements, it would be necessary to undertake Sr-90 recovery operations from spent fuel reprocessing. Strontium 90 recovery from the existing alkaline high level waste (HLW) is not attractive because the isotopic purity of the Sr-90 is below that required for DOD applications. Without reprocessing LWR spent fuel, the demand of 1 MW thermal until FY 1996 could not be met. Strontium-90 is the most economical of the three heat source radionuclides considered. DOE

N83-21935# California Univ., Livermore. Lawrence Livermore Lab.
GAUSSIAN-PROFILE BEAMS
Edward P. Lee 3 Nov. 1982 26 p refs
(Contracts W-7405-eng-48; N60921-82-WR-W0056; ARPA Order 4395)
(DE83-004449; UCID-19639) Avail: NTIS HC A03/MF A01

The growth rate of the hose instability is derived for a beam with Gaussian radial profile, using the spread mass model of phase mix damping. It is found that the maximum growth rate of a convecting wave packet is 49% larger than that derived for a beam with the Bennett profile, and the inverse group velocity (dz/d tau) is also increased by about this amount. A general discussion of spread mass models is presented along with an explanation of the regurgitation phenomena seen in their numerical treatment. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N83-21936*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYTIC DETERMINATIONS OF SINGLE-FOLDING OPTICAL POTENTIALS
Lawrence W. Townsend and Hari B. Bidassaria (Old Dominion Univ., Norfolk, Va.) Feb. 1983 14 p refs
(NASA-TM-84611; NAS 1.15:84611) Avail: NTIS HC A02/MF A01 CSCL 20F

A simple analytic method for calculating nucleon-nucleus optical potentials using a single folding of a Gaussian two body interaction with an arbitrary nuclear distribution is presented. When applied to proton-lead elastic scattering, the predicted real part of the Woods-Saxon potential is in substantial agreement with the experimentally determined phenomenological potential, although there are no adjustable parameters. In addition, the volume integrals of both real potentials are nearly identical. M.G.

N83-21937# Los Alamos Scientific Lab., N. Mex.
ASPECTS OF POSSIBLE MAGMATIC DISRUPTION OF A HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY IN SOUTHERN NEVADA
B. Crowe, R. Amos, F. Perry, S. Self, and D. Vaniman Oct. 1982 43 p refs
(Contract W-7405-eng-36)
(DE83-003990; LA-9326-MS) Avail: NTIS HC A03/MF A01

The Nevada Test Site (NTS) region is located within the central section of a north-northeast-trendity basaltic volcanic belt of late Cenozoic age, a part of the Quaternary volcanic province of the Great Basin. Future volcanism within the belt represents a potential hazard to storage of high-level radioactive waste within a buried repository located in the southwestern NTS. The hazards of future volcanism in the region are being characterized through a combination of volcanic hazards studies, probability determinations, and consequence analyses. Basaltic activity within the NTS regions is divided into two age groups consisting of relatively large-volume silicic cycle basalts (8 to 10 Myr) and rift basalts (less than 8 to 0.3 Myr). This paper describes the processes of basaltic magmatism ranging from derivation of basalt melts at depth, through ascent through the upper mantle and crust, to surface eruption. Each stage in the evolution and dispersal of basaltic magma is described, and the disruption and potential dispersal of stored radioactive waste is evaluated. These data document areas of knowns and unknowns in the processes of basaltic volcanisms and provide background data necessary to assist calculations of radiation release levels due to disruption of a repository. DOE

N83-21938# California Univ., Berkeley. Lawrence Berkeley Lab.
GEOCHEMICAL ASSESSMENT OF NUCLEAR-WASTE ISOLATION. TESTING OF METHODS FOR THE SEPARATION OF SOLID AND AQUEOUS PHASES
R. J. Silva and A. W. Yee 15 Apr. 1982 30 p refs
(Contract DE-AC03-76SF-00098)
(DE83-004047; LBL-14696) Avail: NTIS HC A03/MF A01

Measurement of the solubilities of certain waste radionuclide compounds will be necessary to adequately assess and predict the ability of potential underground waste storage facilities to meet federally established performance criteria. During such measurements, it is usually necessary to physically separate solid and solution phases. Experiments have been conducted to test and compare the relative efficacy of three commonly used separation methods, i.e., gravity settling, centrifugation and filtration. The results indicated that sorption of solution species onto filters can occur and could potentially lead to erroneous results in solubility measurements when one is dealing with trace amounts of radionuclides in solution. The degree of retention by filters depended on the solution pH and the nature of the filter materials. Of the three methods, centrifugation appeared to give the most reliable and consistent results. Filtration was found to give results comparable to centrifugation if care is taken in the selection of filter type. DOE

N83-21939# Sandia Labs., Albuquerque, N. Mex. Seabed Programs Div.
OCEANOGRAPHIC STUDIES TO SUPPORT THE ASSESSMENT OF SUBMARINE DISPOSAL AT SEA. VOLUME 2: APPENDICES
Daniel M. Talbert, comp. Sep. 1982 620 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002289; SAND-82-1005/2) Avail: NTIS HC A99/MF A01

Twenty-one appendices addressing site selection and evaluation, sediment characteristics, biological transport, and other oceanographic parameters are presented. M.G.

N83-21940# California Univ., Livermore. Lawrence Livermore Lab.
STUDIES FOR A FUSION TECHNOLOGY DEVELOPMENT FACILITY
J. N. Doggett 9 Mar. 1982 14 p refs Presented at the A-19 US/Japan Exchange Meeting, Nagoya, Japan, 15-19 Mar. 1982
(Contract W-7405-eng-48)
(DE82-009145; UCRL-86972; CONF-820347-1) Avail: NTIS HC A02/MF A01

Small, driven fusion reactors were studied as candidates for a technology development facility (TDF) to be used for testing reactor subsystems, components, and materials. Magnetic mirror systems are particularly interesting for this application because of their inherent steady state operation, potentially high wall loading, and relatively small size. The systems so far studied have 14 MeV neutron wall loads ranging from 1 to 3 MW sq m on testing surface areas of 2 to 5 sq m with annual fluences as high as 10 to the 21st power neutrons sq cm. DOE

N83-21941# Department of Energy, Washington, D. C.
NUCLEAR POWER FROM FISSION REACTORS: AN INTRODUCTION
Mar. 1982 23 p refs
(DE82-012614; DOE/NE-0029) Avail: NTIS HC A02/MF A01

Basic information concerning nuclear fission energy and different fission reactor concepts is given. DOE

N83-21942# Hanford Engineering Development Lab., Richland, Wash.
UNIQUE FURNACE SYSTEM FOR HIGH-ENERGY-NEUTRON EXPERIMENTS
N. F. Panayotou, D. R. Green, and L. S. Price Mar. 1982 15 p refs Presented at Topical Meeting on Fast, Thermal and Fusion Reactor Experiments, Salt Lake City, Utah, 12 Apr. 1982
(Contract DE-AC06-76FF-02170)

(DE82-014192; HEDL-SA-2603-FP; CONF-820406-10) Avail: NTIS HC A02/MF A01

The low flux of high energy neutron sources requires optimum utilization of the available neutron field. A furnace system was developed in support of the DOE fusion materials program which meets this challenge. Specimens positioned in two temperature zones just 1 mm away from the outside surface of a neutron window in the furnace enclosure can be irradiated simultaneously at two independent, isothermal (+- 1 C) temperatures. The temperature difference between these closely spaced isothermal zones is controllable from 0 to 320 C and the maximum temperature is 400 C. The design of the system also provides a controlled specimen environment, rapid heating and cooling and easy access to heaters and thermocouples. DOE

N83-21943# Stanford Linear Accelerator Center, Calif.
A MICROPROCESSOR-CONTROLLED PHASE-MEASUREMENT SYSTEM FOR 2856-MHz PULSES
J. D. Fox and H. Schwarz Apr. 1982 3 p refs Presented at the 1982 IEEE MTTS Intern. Microwave Symp., Dallas, 15-17 Jun. 1982
(Contract DE-AC03-76SF-00515)
(DE82-014395; SU-SLAC-PUB-2902; CONF-820639-1) Avail: NTIS HC A02/MF A01

A computer controlled phase detection system used to measure and stablize the phase of high power RF pulses in the two mile Stanford Linear Accelerator has been developed. This system measures the phase of a 1 micro sec 2856 MHz 50 MW RF pulse with respect to a CW reference signal at the same frequency at a 180 Hz rate with < 0.2 deg resolution. DOE

N83-21944# Los Alamos Scientific Lab., N. Mex.
RFQ DEVELOPMENT AT LOS ALAMOS Final Report
T. P. Wangler, K. R. Crandall, and R. H. Stokes 1982 6 p refs Presented at the Symp. on Accelerator Aspects of Heavy-Ion Fusion GSI, Darmstadt, West Germany, 29 Mar. - 2 Apr. 1982
(Contract W-7405-eng-36)
(DE82-014049; LA-UR-82-1138; CONF-820338-7) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The basic principles of the radio frequency quadrupole (RFQ) limac are reviewed and a summary of past and present Los Alamos work is presented. Some beam dynamics effects, important for RFQ design, are discussed. A design example is shown for xenon and a brief discussion of low frequency RFQ structures is given. DOE

N83-21945# California Univ., Livermore. Lawrence Livermore Lab.
SOME PROPOSED DISK HEATING, FOCUSING, AND BEAM-TRANSPORT EXPERIMENTS FOR HEAVY-ION INERTIAL-FUSION TEST FACILITIES
James W. K. Mark, R. O. Bangerter, W. M. Fawley, S. Yu, and D. L. Judd (California Univ., Berkeley, Lawrence Berkeley Lab.) 4 Mar. 1982 18 p refs Presented at the 1982 GSI Symp. on Accelerators Aspects of Heavy-Ion Fusion, Darmstadt, West Germany, 29 Mar. 1982 and at the 4th Intern. Topical Conf. on High Power Electron and Ion-Beam Res. and Technol., Palaiseau, France, 4 Mar. 1982
(Contract W-7405-eng-48)
(DE82-012800; UCRL-86189-Rev-1; CONF-820338-5-Rev-1) Avail: NTIS HC A02/MF A01

Calculations suggest that experiments relating to disk heating, as well as beam deposition, focusing and transport can be performed within the context of design proposals for accelerator test facilities. Since the test facilities have lower ion kinetic energy and beam pulse power as compared to reactor drivers, high beam intensities are achieved at the focal spot by using short focal distance and properly designed beam optics. In this regard, the low beam emittance of suggested multibeam designs are very useful. Possibly even higher focal spot brightness could be obtained by plasma lenses which involve external fields on the beam which is stripped to a higher charge state by passing through a plasma cell. DOE

N83-21946# Montreal Univ. (Quebec). Lab. de Physique Nucleaire.
ACTIVITIES REPORT, 1981
Dec. 1981 144 p refs In FRENCH; ENGLISH summary
(DE82-903717; LPN-UM-121; Rept-16) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

Research and progress for 1981 are reported in the following areas: operation and improvement of the Dynamitron and tandem accelerators, experimental and theoretical nuclear physics, nuclear instrumentation and applied nuclear physics, and activities at TRIUMF. DOE

N83-21947# Texas Univ., Austin. Center for Particle Theory.
MULTIPLICITY DISTRIBUTIONS IN HADRON-HADRON COLLISIONS BASED ON THE UNIVERSALITY ANSATZ
C. B. Chiu and Q. Xie Feb. 1982 32 p refs
(Contract DE-AS05-76ER-03992)
(DE82-014588; DOE/ER-03992/576) Avail: NTIS HC A03/MF A01

Experiments on small p sub T hadron production in pp collisions have shed light on the apparent violation of the university ansatz that the multiplicity dispersion in hadron-hadron collisions is much larger than that in e(+)e(-) collisions. A model based on the university ansatz is presented. This model reproduces qualitatively the hadron multiplicity distributions in pp collisions over a wide range of energies. This essentially resolves the discrepancy stated above. In this approach the universality ansatz is also found to be applicable to the diffractive component events. This is supported by the inclusive X-distribution data having various specified number of prongs in the final states. DOE

N83-21948# Institute for Advanced Study, Princeton, N.J.
HEAVY QUARKS IN HADRONIC COLLISIONS
Stanley J. Brodsky and Carsten Peterson (Stanford Univ.) Mar. 1982 21 p refs Presented at the Topical Conf. on Forward Collider Phys., Madison, Wis., 10-12 Dec. 1981 and the Europhys. Study Conf.: Search for Charm, Beauty and Truth at High Energies, Erice, Italy, 15-22 Nov. 1981
(Contract DE-AC03-76SF-00515)
(DE82-014397; SU-SLAC-PUB-2888; CONF-811195-2) Avail: NTIS HC A02/MF A01

The presence of c anti c pairs on the 1 to 2% level in the hadron Fock state decomposition (intrinsic charm) gives a natural description of the ISR data for charm hadron production. The theoretical foundations of the intrinsic charm hypothesis together with its consequences for lepton and hadron induced reactions are discussed in some detail. There is no contradiction with the EMC data on F2/sup c/ provided the appropriate threshold dependence is taken into account. DOE

74 OPTICS

Includes light phenomena.

N83-21949* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DUAL-BEAM SKIN FRICTION INTERFEROMETER Patent
Daryl J. Monson, inventor (to NASA) Issued 10 Jul. 1981 8 p Filed 10 Jul. 1981 Supersedes N81-29415 (19 - 20, p 2769)
(NASA-Case-ARC-11354-1; US-Patent-4,377,343;
US-Patent-Appl-SN-282192; US-Patent-Class-356-357;
US-Patent-Class-73-147) Avail: US Patent and Trademark Office CSCL 20F

A portable dual-laser beam interferometer is described that nonintrusively measures skin friction by monitoring the thickness change of an oil film at two locations while said oil film is subjected to shear stress. An interferometer flat is utilized to develop the two beams. Light detectors sense the beam reflections from the oil film and the surface thereunder. The signals from the detectors are recorded so that the number of interference fringes produced

over a given time span may be counted.
Official Gazette of the U.S. Patent and Trademark Office

N83-21950*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL STEREO VIDEO SIGNAL PROCESSOR Patent Application
Glenn D. Craig, inventor (to NASA) Filed 9 Mar. 1983 18 p
(NASA-Case-MFS-25752-1; US-Patent-Appl-SN-473499) Avail: NTIS HC A02/MF A01 CSCL 20F

An optical video signal processor which produces a two-dimensional cross-correlation is disclosed in real time of images received by a stereo camera system. The optical image of each camera is projected on respective liquid crystal light valves. The images on the liquid crystal valves modulate light produced by an extended light source. This modulated light output becomes the two-dimensional cross-correlation when focused onto a video detector and is a function of the range of a target with respect to the stereo camera. Alternate embodiments utilize the two-dimensional cross-correlation to determine target movement and target identification. NASA

N83-21951# Analytical and Computational Mathematics, Zurich (Switzerland).
STUDY ON THE EXTENSION OF THE STROBOSCOPIC METHOD TO THE SECOND ORDER. VOLUME 2: PERTURBATION BY THE HIGHER DEGREE ZONAL HARMONICS
J.-P. Halbritter Paris ESA Feb. 1982 53 p refs
(Contract ESOC-3856/79/D-JS(SC))
(ESA-CR(P)-1658) Avail: NTIS HC A04/MF A01

The Stroboscopic Method for orbit computation was extended to the higher degree terms of the zonal oblateness perturbation. First order results are presented for the J3, J4, J5 and J6 perturbation, together with the first and second order results of the J2 perturbation. A consistent set of formulas for handling the zonal part of the oblateness perturbation is therefore available. The algebraic manipulator program designed for computing the second order J2 results was used with minor modifications. Author

N83-21952# Marconi Space and Defence Systems Ltd., Portsmouth (England).
OCEAN COLOUR MONITOR (OCM) IMAGE CHANNEL BREADBOARDING Final Report
R. Williams, P. D. Murphy, and J. Gledhill Paris ESA Apr. 1982 310 p
(Contract ESA-4595/81/NL-PP(SC))
(Rept-3991-00025-TN; ESA-CR(P)-1671) Avail: NTIS HC A14/MF A01

Infrared detector parameters and noise mechanisms were reviewed to determine preamplifier requirements. A modified METEOSAT preamplifier design was analyzed to formulate a noise model. Breadboard testing showed the preamplifier meets requirements of the infrared channel. The thick hybrid visible channel preamplifiers constructed for the ocean color monitor breadboard are described as well as the operation of special electro-optical equipment and the breadboard photodiode sensors used. Test results show that suggested modifications of the package of 16 hybrid preamplifiers would meet requirements set by the discrete component visible channel preamplifier with considerable reduction in size. A.R.H.

N83-21953# British Aerospace Aircraft Group, Hertfordshire (England). Space and Communications Div.
DESIGN STUDY AND DEVELOPMENT OF A MAGNETIC BEARING SCANNING MECHANISM (MBSM) FOR OPTICAL SENSOR APPLICATIONS, PHASE 2 Final Report
A. Wild, comp. Paris ESA May 1981 50 p
(Contract ESA-3606/78/NL-AK)
(BAE-TP-7858; ESA-CR(P)-1680) Avail: NTIS HC A03/MF A01

A breadboard model development activity was conducted on a magnetic bearing scanning mechanism for optical sensor applications. Following the Conceptual Design Study performed in Phase 1 of this contract, detailed design was completed such that an experimental MBSM model could be manufactured. Development testing of the suspension and drive elements was then performed, and the design modified accordingly to improve the operational characteristics. The unit was then performance tested to verify compatibility with the requirements of an optical scanner application. Author

N83-21954# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.
APPLICATION OF THE VAN CITTERT-ZERNIKE THEOREM IN THE HETERODYNRECEIVING OF OPTICAL AND IR FREQUENCIES
Friedrich Malota Apr. 1982 20 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-803)
(DFVLR-FB-82-20; ESA-TT-803) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 8,50

The derivation of the heterodyn current with the assumption that waves with various phase differences fall upon a detector device is addressed. The derived results are related to the degree of coherence, which indicate these phase differences. From this and the application of the van Cittert-Zernike theorem the diameter of the source of radiation can be calculated with the required degree of coherence in the position of the detector. Author (ESA)

N83-21955# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECT OF SIZE AND NUMBER (DENSITY) OF MINOR OPTICAL OCCLUSIONS ON TARGET DETECTION PERFORMANCE
William N. Kama and Louis V. Genco Sep. 1982 24 p refs
(AF Proj. 7184)
(AD-A122546; AFAMRL-TR-82-48) Avail: NTIS HC A02/MF A01 CSCL 17/8

A study was conducted to determine the effect of size and number (density per unit area) of minor optical defects contained in an aircraft transparency on aircrew visual performance. Eight subjects performed a target detection task while looking through 13 simulated windscreen test panels. These panels contained defects of size 0.032, 0.043 or 0.35 inches in diameter that varied in number from 11, 22, 33 or 44 per panel. The targets to be detected simulated an aircraft with a frontal plane of 40 feet located at a range of 24,500 feet (0.5 minutes of arc) or 49,000 feet (1.0 minute of arc) being viewed under fairly clear atmospheric conditions (80% contrast) or poor atmospheric conditions (10% contrast). Subject performance was measured in terms of time to detection and percent correct detection. The results obtained indicated that target size and target contrast significantly affected performance, however, the number and size of defects on the windscreen had no effect on performance. Based on this latter finding, it is concluded that current standards and specifications concerning the number and size of minor optical defects permitted on aircraft transparencies may be safely relaxed without adversely affecting aircrew visual performance. GRA

N83-21956# Texas Univ., Austin. Dept. of Electrical Engineering.
AUTOMATIC RECOGNITION AND TRACKING OF OBJECTS Final Scientific Report, 1 Dec. 1980 - 30 Nov. 1981
J. K. Aggarwal Nov. 1981 11 p refs
(Grant AF-AFOSR-3190-77; AF Proj. 2305)
(AD-A121678; AFOSR-82-1002TR) Avail: NTIS HC A02/MF A01 CSCL 17/8

The broad program of research consisted of multisensor image understanding including integration of information from multiple sources, the tracking of objects in a sequence of images in real time, together with the estimation of motion parameters, the characterization of the descriptions and invariances of objects, and the registration of objects. Intensity, color, and range were used in the segmentation of scenes, and the extraction and identification of general areas of interest in the scenes. Shape descriptor provide structural descriptions of objects and lead to

recognition of objects and background components. Motion analysis is instrumental in tracking and prediction of the movement of objects. The analysis and understanding of the structure and motion of three-dimensional space from from a sequence of two-dimensional images in real time is the fundamental goal of the present investigation. GRA

N83-21957# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
PROCESSING TRANSLATIONAL MOTION SEQUENCES
Daryl T. Lawton Oct. 1982 75 p refs
(Contracts N00014-75-C-0459; N00014-82-K-0464)
(AD-A122823; COINS-TR-82-22) Avail: NTIS HC A04/MF A01 CSCL 12/1

This paper presents a procedure for processing real world image sequences produced by relative translational motion between a sensor and environmental objects. In this procedure, the determination of the direction of sensor translation is effectively combined with the determination of the displacements of image features and environmental depth. It requires no restrictions on the direction of motion, nor the location and shape of environmental objects. It has been applied successfully to real-world image sequences from several different task domains. The processing consists of two basic steps: feature extraction and search. The feature extraction process picks out small image areas which may correspond to distinguishing parts of environmental objects. The direction of translational motion is then found by a search which determines the image displacement paths along which a measure of feature mismatch is minimized for a set of features. The correct direction of translation will minimize this error measure and also determine the corresponding image displacement paths for which the extracted features match well. GRA

N83-21958# Letterman Army Inst. of Research, San Francisco, Calif. Div. of Ocular Hazards.
OPTICAL CHARACTERIZATION, VISUAL FUNCTION, AND PURSUIT TRACKING PERFORMANCE USING A 532 nm REFLECTING HOLOGRAPHIC FILTER Preliminary Progress Report, 25 Feb. - 1 Apr. 1982
David A. Stamper, David J. Lund, Gail E. Esgandarian, Richard R. Levine, Bruce F. Stuck, and Edwin S. Beatrice Sep. 1982 13 p refs
(DA Proj. 3E1-62772-A-878)
(AD-A122665; LAIR-82-38TN) Avail: NTIS HC A02/MF A01 CSCL 05/5

A series of tests, involving the optical characterization, visual function, and pursuit tracking, were conducted to evaluate a newly developed laser ocular protective filter. The filter, a reflecting holograph, was designed to provide narrow hand protection against the doubled neodymium (532 nm) wavelength. Optical characterization of the material was determined by measuring broad band radiant transmission through the filter, photopic luminous transmission, optical density (OD) at 532 nm, variation of OD as a function of position, and the relationship between OD and the angle of incidence. Tests of visual function included the Snellen Acuity Chart, Arden Contrast Sensitivity Test, and Farnsworth Munsell 100 Hue Test. Pursuit tracking was evaluated using the BLASER tracking simulator which utilizes a terrain board model with moving targets and a viscous-damped tracking device. The optical characterization test results showed that at the 530 nm rejection band the holographic filter at the 50% transmission point had a band width of 30 nm and a 3.7 OD was achieved over much of the filter. The visual functions test indicated that the subjects had difficulty in color discrimination involving blue and green. No systematic differences were found on the contrast sensitivity test or Snellen Acuity Test. GRA

N83-21959# California Univ., Livermore. Lawrence Livermore Lab.
A PLAN TO DEVELOP FIELD CAPABILITIES FOR FIBER-OPTIC EXPERIMENTS
W. E. Cooper and L. L. Moon 1 Apr. 1982 45 p
(Contract W-7405-eng-48)
(DE82-013520; UCID-19357) Avail: NTIS HC A03/MF A01

Brief descriptions are given of some typical optical fiber experiments, such as high speed digital data link experiments, fiber optics alpha measurements, and time resolved experiments with streak camera recording. Equipment, facilities, and operational procedures required for such experiments are listed, and needed measurement capabilities are expanded upon. Resources required to support optical fiber based experiments in the field on a routine basis are determined. Finally, the equipment and facility expenditures required, including manpower as well as cost, are listed. The work is to be applied to underground nuclear explosives diagnostics. DOE

N83-21960# Sandia Labs., Albuquerque, N. Mex.
HIGH RESOLUTION TEM IMAGING IN FERROMAGNETIC Fe
David M. Follstaedt Sep. 1982 13 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002608; SAND-81-2176) Avail: NTIS HC A02/MF A01

The techniques used to obtain high resolution TEM images of ferromagnetic (bcc) Fe specimens with a JEOL JEM-100 CX microscope are presented. Realignment of the electron optics with the specimen in place gives a resolution of small (approx. 10 A) He bubbles in Fe. The use of a special pole piece designed to minimize the objective lens magnetic field at the specimen is also discussed. DOE

N83-21961# National Oceanic and Atmospheric Administration, Rockville, Md. Federal Coordinator for Meteorological Services and Supporting Research.
AN OVERVIEW OF APPLIED VISIBILITY FUNDAMENTALS: SURVEY AND SYNTHESIS OF A VISIBILITY LITERATURE
Jun. 1982 132 p refs
(PB83-118513; FCM-R3-1982; NOAA-82092103) Avail: NTIS HC A07/MF A01 CSCL 17H

The concept of visibility has been defined in numerous ways. One source that is widely used in the United States describes visibility as the greatest distance at which it is just possible to see and identify selected objects or light sources with the unaided eye, or, it may be considered the distance an observer would have to back away from a target before it disappears. The process by which we see distant objects is based on the characteristics of the target, its immediate surroundings, air quality, illumination of the sight path, and the eyes and brain of the observer. Thus, four components of visibility have been noted: (1) target, (2) background, (3) atmosphere, and (4) observer. Most definitions of visibility include the observer as a key element, but it is also possible to measure visibility without the immediate presence of humans by means of instruments such as telephotometers, transmissometers, or nephelometers. Such measurements can be kept in non-dimensional terms and can be compared without human intervention. When used in the field, however, visibility sensors must be calibrated in human terms of visibility measurement. GRA

N83-21962# Central Inst. for Industrial Research, Oslo (Norway).
FOCUSING AND IMAGING: USE OF THE CONCEPT OF BRAGG DIFFRACTION FOR THE ANALYSIS OF LIGHT SCATTERED FROM RANDOM ROUGH SURFACES
Hans M. Pederson 22 Jul. 1982 13 p refs Presented at the SPIE Symp. Appl. of Math. in Modern Opt., San Diego, Calif., 24-25 Aug. 1982 Sponsored by the Norwegian Royal Council for Scientific and Industrial Research.
(PB83-100800; ISBN-82-767-469-6; NRC/SIR-82-03-03-6) Avail: NTIS HC A02/MF A01 CSCL 20F

The roughness dependence of fully developed speckle can be analyzed by use of a circular Gaussian field model and a three dimensional van Cittert-Zernike theorem. By use of this theorem, the analysis is reduced to the evaluation of an equivalent Bragg diffraction problem and simple physical considerations. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N83-21963# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.
MODELING OF THE LOW-PRESSURE ARGON POSITIVE COLUMN
C. M. Ferriera (Univ. Technologie de Lisboa) and A. Richard Sep. 1982 51 p refs
(Grant NATO-142-81)
(LP-197) Avail: NTIS HC A04/MF A01

An investigation of the properties and operating characteristics of the positive column of a d.c. glow discharge in argon was carried out, both theoretically and experimentally, for gas pressure and discharge current densities typically in the range .001 to -1 torr and 0.1 to 10 mA sq cm, respectively. A test is made of the usefulness of a discharge model which basically is a quasineutral two moment theory modified so as to account for the non Maxwellian character of the electron energy distribution. This distribution is calculated analytically, neglecting the effects of the space charge field. The predicted electron ionization and excitation rates and transport coefficients agree well with electron swarm data and with predictions of numerical computations. The predicted similarity laws of the positive column are in better agreement with the measurements for low pressure, but significant discrepancies are still found with increasing pressure. At pR approximately 1 torr cm the predicted electric field to gas density ratio E/N is about a factor of 2 to 4 larger than measured. S.L.

N83-21964# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.
INVESTIGATION OF AN ELECTRIC DISCHARGE IN A NITROGEN-HYDROGEN MIXTURE FOR THE NITRIDATION OF METAL SURFACES [ETUDE D'UNE DECHARGE ELECTRIQUE DANS UN MELANGE AZOTE-HYDROGENE POUR LA NITRURATION DE SURFACES METALLIQUES]
Luc Petitjean Oct. 1982 160 p refs In FRENCH; ENGLISH summary
(LP-198) Avail: NTIS HC A08/MF A01

Nitriding of iron surfaces was achieved by using N2-H2 glow discharges at medium pressures (3 Torr), and low current discharge (1 to 5 mA/cu cm). The sample temperature, used as cathode, is 800 to 840 K. The N2, N2(+), NH, H, and metal atom excited states were detected by emission spectroscopy, allowing the determination of vibrational and rotational structure analysis. The NH radicals appear to issue from the cathode surface as for the metal atoms. By using argon as a gas impurity (2%), it was found that the N2 (C3 II sub u) states are directly excited. The relative variation of the H2 dissociation degree was determined in the range 1 to 90% of H2. Some results of treatments are given showing the H2 influence. The negative glow and the cathode dark space are studied, with literature data, in order to determine the main reactions occuring in the cathode sheath and leading to nitriding. The importance of the charge transfer reaction in the cathode dark space is addressed. M.G.

N83-21965# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
ON FUSION AND FISSION BREEDER REACTORS: THE IIASA REPORT RR-77-8 REVIEWED AND UPDATED
B. Brandt, H. T. Klippel (Stitchting Energieonderrzoek Centrum Ned.), and W. Schuurman Feb. 1981 66 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-81-129) Avail: NTIS HC A04/MF A01

Fusion reactors and fission breeder reactors are discussed. Comparisons of the two nuclear systems as possible answers to the world's energy needs are made. L.F.M.

N83-21966# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE EFFECT OF TRAPPED ELECTRONS ON THE WAVE-INDUCED CURRENT
Masayoshi Taguchi (Tokyo Univ., Japan) Jan. 1983 24 p refs
(IPPJ-620) Avail: NTIS HC A02/MF A01

The wave induced current in a toroidal magnetic field is computed by use of the adjoint drift-kinetic equation for electrons. The inverse aspect ratio of a toroidal device is assumed to be small and the lowest-order terms of this ratio are retained. As the wave absorption mechanism, the electron cyclotron damping and the electron Landau dampling are considered. It is found that the induced current decreases considerably by the effect of the trapped electrons when the phase velocity of a plasma wave is low. M.G.

N83-21967# Nagoya Univ. (Japan). Inst. of Plasma Physics.
MEASUREMENT OF SMALL-SCALE DENSITY FLUCTUATION IN JIPP T-II PLASMA BY MILLIMETER AND SUB-MILLIMETER WAVE SCATTERING
T. Tetsuka, T. Nishizawa, K. Sakai, A. Mase (Tsukuba Univ., Ibaraki, Japan), T. Tsukishima, and J. Fujita Dec. 1982 32 p refs
(IPPJ-619) Avail: NTIS HC A03/MF A01

The small space density fluctuations were studied by both millimeter (2 mm) and sub millimeter (337 micron) wave scattering techniques in JIPP T-II region of the plasma column, and show the characteristics of the drift wave mode turbulence. The density fluctuation level is n/n sub 0 approxmately or equal to 1 to 1.5% around the plasma edge, and this value is inversely proportional to the mean electron density. Further, the dependence of the fluctuational level on the plasma parameters is studied and compared with the scaling law of the energy confinement time of the plasma. The diffusion coefficient estimated from the density fluctuation is about one third of the global fusion coefficient. S.L.

N83-21968# Naval Research Lab., Washington, D. C.
LABORATORY SIMULATIONS OF CONTROLLED ENERGETIC ELECTRON-BEAM-PLASMA INTERACTIONS IN SPACE Interim Report
E. P. Szuszczewicz 9 Nov. 1982 32 p refs
(Contract NA79RAA04487; RR0330244)
(AD-A121683; AD-E000509; NRL-MR-4943) Avail: NTIS HC A03/MF A01 CSCL 20/7

Recent laboratory investigations of space simulated electron beam plasma interactions have concentrated on the transition from single particle behavior to collective plasma processes with emphasis on the beam plasma discharge. The plasma has been characterized with respect to its spatial distributions in density, temperature and density fluctuation power spectra. The latter results have been further class1fied in terms of amplitude and spectral distributions. The overall results include: (1) detailed radial profiles of plasma density as a function of beam parameters; (2) the association of low frequency large amplitude fluctuations with ion acoustic, ion cyclotron and drift wave modes; (3) the identification and spatial mapping of suprathermal electrons in the beam core; and (4) the experimental definition of a density dependent criterion for the ignition of the beam plasma discharge. The data provide a synoptic perspective on accumulated rocket observations and meaningfully contribute to planning activities for future space borne applications of artificially injected energetic electron beams. GRA

N83-21969# JAYCOR, Alexandria, Va.
MODELING OF IMPLODED ANNULAR PLASMAS Final Report, 5 Feb. 1979 - 1 May 1981
Robert E. Terry and John U. Guillory 1 May 1981 85 p refs
(Contract DNA001-79-C-0189)
(AD-A122651; J207-81-004; DNA-5926F) Avail: NTIS HC A05/MF A01 CSCL 20/9

This document presents the advances made in three major areas during the 1980 theoretical program in support of the NRL Plasma Radiation group. This support has provided new directions in which to seek quantitative explanation of the wire array radiation pulse and advancements in numerical and computational methodologies. The areas treated in this report are: (1) improvements to the 1-D magneto-hydro-dynamics SPLAT code

and development of scaling laws governing the radiative output using this code; (2) development of calculations for solving the electric and magnetic field penetration/skin-depth problem in an inhomogeneous, time-varying imploding conductor in a plasma-loaded diode; (3) circuit equation and scaling of hard radiation in the presence of fully developed beading of the assembled plasma. Work in progress is also discussed. GRA

N83-21970# Naval Research Lab., Washington, D. C.
ON THE STABILITY OF VORTEX MOTIONS IN THE PRESENCE OF MAGNETIC FIELDS Interim Report
Y. T. Fung 23 Dec. 1982 33 p refs
(RR0230141)
(AD-A122648; NRL-MR-4976) Avail: NTIS HC A03/MF A01 CSCL 20/9

Stability analyses are performed on a general type of vortex flows with density inhomogeneity and with both the axial and azimuthal magnetic fields. A sufficient condition for stability, subject to arbitrary perturbations, is derived. The condition, however, involves the complex eigenfrequency. Nevertheless, we are able to examine how the flow profile influences the flow characteristics by studying three general types of perturbations. Analytical solutions are obtained to support the resultant arguments. Unlike the axial velocity which always destabilizes the flow, the azimuthal velocity can convey either stabilizing or destabilizing effects depending on the gradient it possesses and the centrifugal force field it creates. This characteristic is shown in all the three general types of perturbations to the flow. For flow subject to azimuthal perturbations, an upper bound on the complex phase velocity, which is reminiscent of the semi-ellipse theorem in the non-hydromagnetic case, is found for some flow profiles satisfying a constraint. Even though it cannot be observed directly from the sufficiency conditions or from the bound on the unstable waves, we are able to show that the presence of the magnetic field, regardless of the detailed profile, always stabilizes azimuthal perturbations. Such an argument is also supported by exact solutions to the governing stability equations. For uniform rotation and constant Alfven velocities, azimuthal instabilities can only occur when negative density gradients exist within the flow domain. Furthermore, the phase velocity for such instabilities must lie on a semi-circle in the complex phase velocity plane independent of the detailed density profile. GRA

N83-21971# New York Univ., New York. Magneto-Fluid Dynamics Div.
MAGNETIC AND DRIFT SURFACES IN TOROIDAL-PLASMA EQUILIBRIA
Michael Marcal Oct. 1982 134 p refs
(Contract DE-AC02-76ER-03077)
(DE83-004378; DOE/ER-03077/178; MF-98) Avail: NTIS HC A07/MF A01

A method was developed for following magnetic field lines and guiding center orbits of isolated charged particles in toroidal plasma configurations with no spatial symmetries. The heart of the method lies in a divergence-free approximation to a numerical equilibrium magnetic field B that was computed over a grid of points by a computer code. Considerations from the KAM theory for Hamiltonian systems and the results of the studies lead to the belief that the solenoidal proprty of B, del. B = 0 must be preserved to be able to follow trajectories in the torus adequately. DOE

N83-21972# Los Alamos Scientific Lab., N. Mex.
OBSERVED MECHANISM OF TERMINATION IN THE ZT-40M REVERSED-FIELD PINCH
Abram R. Jacobson and Michael G. Rusbridge Nov. 1982 54 p refs
(Contract W-7405-eng-36)
(DE83-003989; LA-9589-MS) Avail: NTIS HC A04/MF A01

The termination process in the ZT-40M reversed-field pinch has been studied using multichord interferometry supplemented by other diagnostics. The abrupt fall of the toroidal current is observed to occur when the ratio toroidal current/line density lies in the range 1 x 10 (-13) less than or = I sub phi/N less than or = to 2 x 10 (-13) A-m. This is consistent with the attainment of a drift threshold, in which the electron drift speed (along the magnetic field) approaches the electron thermal speed. The edge region of the discharge experiences a termination precursor disturbance which appears to result from the local attainment of this drift threshold. The termination precursor is phase-locked to an m = 0 plasma density oscillation which arises earlier during the discharge but obtains large amplitudes only during the pretermination phase. DOE

N83-21973# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
ROTATIONAL STABILITY OF TANDEM MIRRORS
J. P. Friedberg and D. A. D'Ippolito Nov. 1982 42 p refs
(Contract DE-AC03-76ET-53057)
(DE83-003744; SAI-254-82-303-LJ; PRI-55) Avail: NTIS HC A03/MF A01

The general stability equation for low m rotational ballooning instabilities in axisymmetric mirror geometry is derived for an isotropic pressure plasma, including a boundary term which represents the stabilizing effect of an unspecified anchor. The corresponding variational principle, together with a particular quadrupole anchor model, is used to compute the low beta rotational interchange mrginal stability condition for a conventional tandem mirror. The stability criterion is applied to show that low m rotational modes are stable in the TMX experiment. Also, a mechanism for enhanced stabilization of curvature driven modes when E sub r < 0 is discussed. DOE

N83-21974# Texas Univ., Austin. Inst. for Fusion Studies.
HOT-PLASMA DECOUPLING CONDITION FOR LONG-WAVELENGTH MODES
H. L. Berk, J. W. VanDam, and D. Spong (ORNL) Oct. 1982 13 p refs
(Contract DE-FG05-80ET-53088)
(DE83-003210; DOE/ET-53088/72) Avail: NTIS HC A02/MF A01

The stability of layer modes is analyzed for z-pinch and bumpy cylinder models. These modes are long wavelength across the layer and flute-like along the field line. The stability condition can be expressed in terms of the ratio of hot to core plasma density. It is shown that to achieve conditions close to the Nelson, Lee-Van Dam core beta limit, one needs a considerably smaller hot to core plasma density than is required to achieve stability at zero core beta. DOE

N83-21975# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
QUASILINEAR THEORY OF SUPRATHERMAL IONS IN MIRROR MACHINES IN THE PRESENCE OF RF FLUCTUATIONS
B. Hafizi and R. E. Aamodt Nov. 1982 22 p refs
(Contract DE-AC03-76ET-53057)
(DE83-003932; SAI-254-82-323-LJ; PRI-57) Avail: NTIS HC A02/MF A01

A theory of fast-ion generation in the 2XIIB mirror experiment due to a single resonant electrostatic ion cyclotron mode is presented. Assuming weak radial gradients of the magnetic induction, which appear to be consistent with experimental data, it is shown that ions with small parallel excursions can be accelerated into the 40 keV region. Allowance for a periodic temporal variation of the amplitude of the wave results in stochastic motion of those ions whose range of initial parallel excursions form a limited but significant fraction of the length of the plasma. The diffusion coefficients of this class of ions are computed in the quasilinear approximation. The corresponding diffusion times are in reasonable accord with those from the experiment. DOE

N83-21976# Michigan Univ., Ann Arbor. Dept. of Nuclear Engineering.
KINETIC TREATMENT OF ALPHA-PARTICLE LOSS AND ENERGY DEPOSITION IN ELMO BUMPY TORUS
M. E. Fenstermacher and N. A. Uckan Dec. 1982 52 p refs
(Contract W-7405-eng-26)

(DE83-004234; ORNL/TM-8431) Avail: NTIS HC A04/MF A01

A formalism has been developed in terms of a drift kinetic equation with a Fokker-Planck collision operator to calculate alpha particle loss and energy deposition rate coefficients for one position in space and for steady-state operating conditions. A bounce-averaged drift kinetic equation for an ELMO Bumpy Torus (EBT) is expressed in invariant variables E = v(2)/2 and lambda = v/sub perpendicular/(2)B/sub MID//v(2)B(1) and is used with energy scattering and pitch angle scattering terms in the collision operator. The alpha particle distribution function is expanded in terms of energy coefficients and pitch angle eigenfunctions. For the case of a square well magnetic field shape, the pitch angle eigenfunctions are the Legendre polynomials. With an expression for the distribution function the particle loss and energy deposition rates are calculated by taking the zeroth and first-order energy moments, respectively, of the kinetic equation. DOE

N83-21977# Austin Research Associates, Inc., Tex.

STUDY OF TRANSPORT MECHANISMS FOR ENERGETIC-ION HEATING OF INTOR-SIZE TOKAMAKS Quarterly Technical Report, 1 Sep. - 30 Nov. 1982

W. E. Drummond Dec. 1982 52 p

(Contract DE-AC05-82ER-53131)

(DE83-004124; DOE/ER-53131/2; COO-3131-2; I-ARA-82-U-112; ARA-472) Avail: NTIS HC A04/MF A01

Under DOE sponsorship, Austin Research Associates is engaged in a study of transport of energetic ion beams into the plasma region of a large Tokamak device; and the subsequent charge stripping and trapping of such ions within the plasma for heating purposes. During the past three months, our technical effort has been directed at a more quantitative follow-up on the qualitative results previously reported. The following tasks were undertaken: (1) Develop an in-house computer code which computes the actual magnetic fields generated by an INTOR-size Tokamak. (2) Create a similar magnetic field data base from existing codes available at LLNL and transport this data base to Austin Research. (3) Develop the appropriate particle push code to utilize these two magnetic field data base codes for analysis of particle trajectories. (4) Examine the promising parameter regime of high atomic number, large Larmor radius ions for use as candidates for plasma heating. (5) Examine passive shielding techniques for transport of such ions through the toroidal magnetic field coils to the vicinity of the plasma. DOE

N83-21978# Wisconsin Univ., Madison. Dept. of Nuclear and Electrical Engineering.

INVESTIGATION OF AUXILIARY HEATING IN TANDEM MIRRORS AND TOKAMAKS AND BARRIER CELL PUMPING Final Report for the period ending 31 Dec. 1981

G. A. Emmert and J. Scharer Aug. 1982 9 p refs

(Contract DE-AC02-79ET-53083)

(DE83-003132; DOE/ET-53083/4) Avail: NTIS HC A02/MF A01

Physics questions concerned with ECRH heating in tandem mirror plugs, pumping of tandem mirror thermal barriers by drift orbits, ICRH heating in Tokamaks, and bundle divertors were studied. It is concluded that drift-orbit pumping of thermal barriers is not feasible because the azimuthal vector E x vector B drift limits the excursion of trapped ions from a flux surface. A three-dimensional weakly relativistic (T sub e less than or equal to 50 keV) ray tracing and absorption code for electron cyclotron heating in tandem mirror plugs and barriers was developed. Cases run for TMX, MFTF-B and reactors at T sub e > 10 keV show that strong absorption per pass is present and a careful choice of wave frequency and launch angle is required to ensure wave penetration and absorption in the plasma core. In the area of ion cyclotron frequency range heating in Tokamaks, a three-dimensional hot plasma ray tracing theory and code was developed to handle rays launched from any poloidal angle in the Tokamak cross section. Wave heating in the central strong absorption zones is currently being investigated using a full wave solution for the various heating regimes. DOE

N83-21979# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

ELMO BUMPY TORUS PROOF OF PRINCIPLE, PHASE 2, TITLE 1 REPORT. VOLUME 6: INSTRUMENTATION AND CONTROL

R. J. Schmitt 26 Feb. 1982 444 p ref 9 Vol.

(Contract W-7405-eng-26)

(DE83-001823; ORNL/Sub-81/21099/1-06; EBT-P010) Avail: NTIS HC A19/MF A01

Design criteria and descriptions of the instrumentation and controls are given. The interfaces between all the various systems are detailed. DOE

N83-21980# Argonne National Lab., Ill. Electromagnetic Technology Fusion Power Program.

SUMMARY OF SENSOR EVALUATION FOR THE FUSION ELECTROMAGNETIC INDUCTION EXPERIMENT (FELIX)

Martin J. Knott Aug. 1982 35 p refs

(Contract W-31-109-eng-38)

(DE83-002318; ANL/FPP-TM-158) Avail: NTIS HC A03/MF A01

As part of the First Wall/Blanket/Shield Engineering Test Program, a test bed called FELIX (fusion electromagnetic induction experiment) is under construction. Its purpose is to test, evaluate, and develop computer codes for the prediction of electromagnetically induced phenomenon in a magnetic environment modeling that of a fusion reaction. Crucial to this process is the sensing and recording of the various induced effects. Sensor evaluation for FELIX reached the point where most sensor types were evaluated and preliminary decisions are being made as to type and quantity for the initial FELIX experiments. These early experiments, the first, flat plate experiment in particular, will be aimed at testing the sensors as well as the pertinent theories involved. The reason for these evaluations, decisions, and proof tests is the harsh electrical and magnetic environment that FELIX presents. DOE

N83-21981# California Univ., Livermore. Lawrence Livermore Lab.

HOT ELECTRONS IN THE ANCHOR REGION OF THE AXICELL DESIGN OF THE MIRROR FUSION TEST FACILITY (MFTF)

J. W. Shearer 14 Sep. 1982 49 p refs

(Contract W-7405-eng-48)

(DE83-001614; UCID-19577) Avail: NTIS HC A03/MF A01

The axicell design of the Mirror Fusion Test Facility (MFTF) requires electron cyclotron resonance heating (ECRH) up to average electron energies of as high as 450 keV. These temperatures, plus the magnetic field and plasma beta profiles, lead to the requirements for three frequencies-28, 35, and 56 (or 60) GHz. Power balance studies include the effects of scattering drag, synchrotron radiation, and cold electron production, and they predict that about 600 kW of ECRH power is needed at each end of MFTF. DOE

N83-21982# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

METHODS TO ENHANCE BLANKET POWER DENSITY IN LOW-POWER FUSION DEVICES

P. Y. Hsu, L. G. Miller, T. S. Bohn, G. A. Deis, G. R. Longhurst, L. S. Masson, D. E. Wessol, and M. A. Abdou Jun. 1982 13 p refs

(Contract DE-AC07-76ID-01570)

(DE82-017466; EGG-FT-5893) Avail: NTIS HC A02/MF A01

The extent to which the power density in the FED breeder blanket test modules can be enhanced by artificial means was investigated. Assuming a viable approach can be developed, it will allow testing of advanced reactor blanket modules on INTOR at representative conditions. The tentative approach adopted for this task consists of three parts. First, the requirements for augmented heating of the test module are outlined for different applications of interest. Second, methods are identified which have potential for augmenting the heating power in a test module, and this list is narrowed to those which appear to be most useful. Finally, these methods are examined in more detail to determine the practical benefits of employing each. DOE

N83-21983# Oak Ridge National Lab., Tenn. Engineering Physics Div.
DOSE RATES FROM INDUCED ACTIVITY IN THE ELMO BUMPY TORUS PROOF-OF-PRINCIPLE DEVICE
R. G. Alsmiller, Jr., R. T. Santoro (Union Carbide Corp.), J. Barish, and J. M. Barnes (Union Carbide Corp.) Oct. 1982 19 p refs Submitted for publication
(Contract W-7405-eng-26)
(DE83-002584; ORNL/TM-8505) Avail: NTIS HC A02/MF A01

Calculated results of the dose rates from induced activity in the enclosure of the Elmo Bumpy Torus proof-of-principle device (EBT-P) are presented. A cylinder model of EBT-P is used. EBT-P will have a hydrogen plasma and thus the plasma will not produce neutrons, but substantial numbers of photoneutrons will be produced and it is the induced activity from these photoneutrons that is considered. The activation dose rates are presented for a variety of operating times and times after shutdown. DOE

N83-21984# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
PARTICLE EXCHANGE IN THE PLUG OF A THERMAL-BARRIER TANDEM MIRROR
Peter J. Catto and Rodolfo Carrera (Wisconsin Univ., Madison) Oct. 1982 22 p refs
(Contract DE-AC03-76ET-53057)
(DE83-002652; SAI-254-82-242-LJ; PRI-48) Avail: NTIS HC A02/MF A01

The collisional fluxes of trapped electrons escaping from the plug and the center cell electrons passing over the thermal barrier and becoming trapped are evaluated for a simple thermal barrier model appropriate to present tandem mirror experiments. DOE

N83-21985# Science Applications, Inc., Boulder, Colo. Plasma Research Inst.
REDUCTION OF THE RADIAL LOSSES IN BUMPY TORI
P. J. Catto and R. D. Hazeltine Oct. 1982 20 p refs
(Contract DE-AC03-76ET-53057)
(DE83-002650; SAI-254-82-281-LJ; PRI-53) Avail: NTIS HC A02/MF A01

Toroidal corrections to the fields in a bumpy torus cause the particle drift surfaces to depart from the magnetic flux surfaces, thereby resulting in transport and direct radial losses. Such losses can be reduced by choosing field structures such that the drift and flux surfaces remain close everywhere. A technique is presented for finding, analytically, such optimized fields in the near axis, vacuum approximation. DOE

N83-21986# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
ELMO BUMPY TORUS PROOF OF PRINCIPLE, PHASE 2, TITLE 1. VOLUME 5: VACUUM-PUMPING SYSTEM
C. F. Dillow, G. L. Adlon, V. E. Stubblefied, and R. J. Busam 26 Feb. 1982 251 p refs
(Contract W-7405-eng-26)
(DE83-001504; ORNL/Sub-81/21099/1-05) Avail: NTIS HC A12/MF A01

The Preliminary Design of the EBT-P Vacuum Pumping System is summarized. The Vacuum Pumping System was designed by the McDonnell Douglas Astronautics Co. - St. Louis (MDAC). It includes the necessary vacuum pumps and vacuum valves to evacuate the torus, the Mirror Coil Dewars (MC Dewars), and the Gyrotron Magnet Dewars. The pumping ducts, manifolds, and microwave protection system are also included. A summary of the function of each subsystem and a description of its principal components is provided. The analyses performed during the system design are also identified. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N83-21987*# RCA Labs., Princeton, N. J.
ADVANCED 3-V SEMICONDUCTOR TECHNOLOGY ASSESSMENT Final Report, 20 Jul. 1981 - 19 Jul. 1982
M. Nowogrodzki Feb. 1983 235 p refs 2 Vol.
(Contract NAS3-22884)
(NASA-CR-168101; NAS 1.26:168101; RCA-PRRL-82-CR-18) Avail: NTIS HC A11/MF A01 CSCL 20L

Components required for extensions of currently planned space communications systems are discussed for large antennas, crosslink systems, single sideband systems, Aerostat systems, and digital signal processing. Systems using advanced modulation concepts and new concepts in communications satellites are included. The current status and trends in materials technology are examined with emphasis on bulk growth of semi-insulating GaAs and InP, epitaxial growth, and ion implantation. Microwave solid state discrete active devices, multigigabit rate GaAs digital integrated circuits, microwave integrated circuits, and the exploratory development of GaInAs devices, heterojunction devices, and quasi-ballistic devices is considered. Competing technologies such as RF power generation, filter structures, and microwave circuit fabrication are discussed. The fundamental limits of semiconductor devices and problems in implementation are explored. A.R.H.

N83-21988*# RCA Labs., Princeton, N. J.
ADVANCED 3-V SEMICONDUCTOR TECHNOLOGY ASSESSMENT Executive Summary Final Report
M. Nowogrodzki Feb. 1983 9 p 2 Vol.
(Contract NAS3-22884)
(NASA-CR-168102; NAS 1.26:168102; RCA-PRRL-82-CR-18) Avail: NTIS HC A02/MF A01 CSCL 20L

Against a background of an extensive survey of the present state of the art in the field of III-V semiconductors for operation at microwave frequencies (or gigabit rate speeds), likely requirements of future space communications systems are identified, competing technologies and physical device limitations are discussed, and difficulties in implementing emerging technologies are projected. On the basis of these analyses, specific research and development programs required for the development of future systems components are recommended. Author

N83-21989*# Cornell Univ., Ithaca, N. Y. Dept. of Electrical Engineering.
GRAPHOEPITAXY OF GaAs ON MOLYBDENUM Final Technical Report, 1 Jul. 1980 - 31 Oct. 1981
R. M. Fletcher, D. K. Wagner, and J. M. Ballantyne 1982 42 p refs
(Contract NAG1-83)
(NASA-CR-170104; NAS 1.26:170104) Avail: NTIS HC A03/MF A01 CSCL 20L

A program for investigating the grain enlargement resulting from the laser recrystallization of a thin gallium arsenide film on a patterned substrate, a technique known as graphoepitaxy was evaluated. More specifically, the effects of recrystallizing an uncapped gallium arsenide film using a continuous wave neodymium YAG laser operating at 1.06 microns were studied. In an effort to minimize arsenic loss from the film, the specimens were held in an arsine atmosphere during recrystallization. Two methods for fabricating patterned substrates were developed, one using reactive ion etching of a molybdenum film on both sapphire and silicon substates and another by preferential wet etching of a silicon substrate onto which a film of molybdenum was subsequently deposited. Author

N83-21990*# Cornell Univ., Ithaca, N. Y. Lab. of Atomic and Solid State Physics.
GROUND STATE ENERGY OF ELECTRONS IN A STATIC POINT-ION LATTICE
D. F. Styer and N. W. Ashcroft Mar. 1983 15 p refs
(Grant NAG2-159)
(NASA-CR-170127; NAS 1.26:170127; MSC-4943) Avail: NTIS HC A02/MF A01 CSCL 20L

The ground state energy of a neutral collection of protons

and electrons was investigated under the assumption that in the ground state configuration, static protons occupy the sites of a rigid Bravais lattice. The Wigner-Seitz method was used in conjunction with three postulated potentials: bare Coulomb, Thomas-Fermi screening, and screening by a uniform bare background charge. Within these approximations, the exact band-minimum energy and wave functions are derived. For each of the three potentials, the approximate minimum ground state energy per proton (relative to isolated electrons and protons) is, respectively, -1.078 Ry, -1.038 Ry, and -1.052 Ry. These three minima all fall at a density of about 0.60 gm/cu cm, which is thus an approximate lower bound on the density of metallic hydrogen at its transition pressure. Author

N83-21991*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A STUDY OF PRODUCTION OF MISIBILITY GAP ALLOYS WITH CONTROLLED STRUCTURES

R. A. Parr, M. H. Johnston, J. A. Burka, J. H. Davis, and J. A. Lee Mar. 1983 43 p refs

(NASA-TP-2144; NAS 1.60:2144) Avail: NTIS HC A03/MF A01 CSCL 20L

Composite materials were directionally solidified using a new technique to align the constituents longitudinally along the length of the specimen. In some instances a tin coating was applied and diffused into the sample to form a high transition temperature superconducting phase. The superconducting properties were measured and compared with the properties obtained for powder composites and re-directionally solidified powder compacts. The samples which were compacted and redirectionally solidified showed the highest transition temperature and wildest transition range. This indicates that both steps, powder compaction and resolidification, determine the final superconducting properties of the material. Author

N83-21992# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.

EFFECTS OF CRYSTALLINE ORIENTATION ON ENVIRONMENTAL STABILITY AND LUBRICATION PROPERTIES OF SPUTTERED MoS2 THIN FILMS

P. D. Fleischauer 14 Mar. 1983 30 p refs

(ATR-82(8435)-1) Avail: NTIS HC A03/MF A01

The endurance lives of RF sputtered MoS2 lubricant films are severely degraded by exposure to high humidity environments prior to wear testing. Surface chemical and electron microscopic analyses show that the degraded films are oxidized to form MoO3 and that the oxidation rate is a function of the orientation of the crystallites composing the films before any run in or burnishing activity. If the crystallites are arranged with their basal planes parallel to the substrate surface, the films have lower reactivity (good stability) and longer endurance lives than films with randomly oriented crystallites. The results of surface analyses and wear tests are presented to support these observations. Auger electron spectroscopy results indicate that oxidation of the randomly oriented films (designated type 1 films) occurs to a depth of at least 10 nm into the bulk of the films when they are exposed to adverse environments. Oxidation of films with coplanar orientations (type 2 films) occurs only within 1 to 2 nm of their surfaces. S.L.

N83-21993*# National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD OF MAKING MACROCRYSTALLINE OR SINGLE CRYSTAL SEMICONDUCTIVE MATERIAL AND PRODUCTS PRODUCED THEREBY Patent Application

Paul J. Shlichta (JPL, California Inst. of Tech., Pasadena) and R. James Holliday, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 10 Feb. 1983 12 p

(Contract NAS7-100)

(NASA-Case-NPO-15904-1; US-Patent-Appl-SN-465369) Avail: NTIS HC A02/MF A01 CSCL 20L

A macrocrystalline or single crystal semiconductive material is formed from a primary substrate including a single crystal or several very large crystals of a relatively low-melting material. This primary substrate is deposited on a base such as steel or ceramic, and it may be formed from such metals as zinc, cadmium, germanium, aluminum, tin, lead, copper, brass, magnesium silicide, or magnesium stannide. These materials generally have a melting point below about 1000 C and form on the base crystals the size of fingernails or greater. The primary substrate has an epitaxial relationship with a subsequently applied layer of material, and because of this epitaxial relationship, the material deposited on the primary substrate will have essentially the same crystal size as the crystals in the primary substrate. If required, successive layers are formed, each of a material which has an epitaxial relationship with the previously deposited layer, until a layer is formed which has an epitaxial relationship with the semiconductive material. This layer is referred to as the epitaxial substrate, and its crystals serve as sites for the growth of large crystals of semiconductive material. The primary substrate is passivated to remove or otherwise convert it into a stable or nonreactive state prior to deposition of the semiconductive material. NASA

N83-21994# Naval Research Lab., Washington, D. C. Solid State Devices Branch.

APPLICATION OF ION IMPLANTATION INDUCED DAMAGE TO ELECTRON DEVICE FABRICATION IN InP

P. E. Thompson, S. C. Binari, and H. B. Dietrich 15 Dec. 1982 26 p refs

(XR0210201)

(AD-A122496; NRL-MR-4982) Avail: NTIS HC A03/MF A01 CSCL 20/8

A detailed study of the insulating properties of ion-implantation induced damage in InP has been carried out for H, He, B, and Be implantation. For each ion, there was found to be an optimal implantation fluence for the formation of resistive layers. At this fluence, a maximum resistivity of 1000 to 10000 ohm cm was observed. Lower resistivities were observed for higher and lower implantation fluences. The primary anneal stage for the maximum resistivity layers was between 250 and 300 C. Anomalous results were observed for H implantation in that measurements carried out by contacting the front and back of the damage layer gave resistivity values two orders of magnitude greater than those measured by contacting to adjacent points on an isolated epitaxial structure. For all other ions, the results obtained for the two geometries were in good agreement. It has been shown that a conductive layer produced by the proton bombardment of the underlying Fe-doped substrate gives rise to a low resistance shunt in the epitaxial study. GRA

N83-21995# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.

SYSTEM TO MEASURE CARRIER DRIFT VELOCITY IN SEMICONDUCTOR MATERIALS

G. M. Homsey, F. J. Rosenbaum, and R. E. Goldwasser Aug. 1982 119 p refs

(Contract N00014-79-C-0840)

(AD-A121734; Rept-82-4-ONR) Avail: NTIS HC A06/MF A01 CSCL 20/12

A technique for measuring average drift velocity of electrons in a semiconductor is presented. A 6 GHz modulated electron beam is used to inject carriers into a reverse biased Schottky diode and the phase of the external circuit current is measured for each applied voltage. Non-uniform electric fields and parasitic impedances are accounted for. Numerical methods are used to generate a V(E) curve commensurate with measured phase-voltage data. Results for short (1.6 micron), highly doped (4 x 10 to the fifteenth power/cu cm) GaAs samples are reported. GRA

N83-21996# Rome Air Development Center, Griffiss AFB, N.Y. EM Materials Technology Branch.

HIGH PURITY InP GROWN BY THE VAPOR PHASE EPITAXY: HYDRIDE METHOD

Thomas E. Erstfeld and Kenneth P. Quinlan Jun. 1982 22 p refs

(AF Proj. 4600)

(AD-A121687; RADC-TR-82-180) Avail: NTIS HC A02/MF A01

CSCL 07/1

A procedure was devised for the growing of high purity InP by the vapor phase epitaxy (VPE)-hydride method. A continuous in situ each with HCl of the InP substrate and the epitaxial layer under growth was developed in the VPE-hydride reactor. A study of the effect of the continuous in situ etch of HCl on the growth rates and properties of epitaxial layers prepared by the vapor phase epitaxy-hydride technique is reported. Growth rates were determined as a function of the following variables. HCl flow rates in the mixing and source zones, PH3 flow rates, and mixing zone temperatures. Epitaxial InP structures with good morphology were obtained when the continuous HCl etch was varied between 0.8 and 1.5 cc/min. The average values (77 K) of the carrier concentrations and mobilities were 1.3 x 10 to the 15th power/cc and 23,000 sq cm/V/sec, respectively. The study indicates that the continuous in situ HCl etch improves the quality of the epitaxial InP layers. GRA

N83-21997# Technische Universitaet, Hanover (West Germany).
INFLUENCE OF THE ATOMIC ROUGHNESS AT THE Si-Si-O2 INTERFACE Final Technical Report, Dec. 1980 - Dec. 1981
M. Henzler and P. O. Hahn Sep. 1982 32 p refs
(Contract DAJA37-81-C-0054; DA Proj. 1T1-61102-BH-57)
(AD-A122276) Avail: NTIS HC A03/MF A01 CSCL 20/12

Special MOS-FET's have been prepared to check a correlation between the atomic roughness at the Si/SiO2 interface (as determined by the novel technique of spot profile analysis in the LEED pattern, SPA-LEED) and the electronic mobility in the MOS-device. The transistors have been tested in the temperature range from room temperature down to liquid helium (4 K). Four different sets of transistors with different roughness have been prepared. The roughness has been determinated at large areas with gate oxide on the same chip (without transistor structures, however). Preliminary measurements of mobility show the predicted correlation between roughness and mobility. Author (GRA)

N83-21998# Harry Diamond Labs., Adelphi, Md.
LECTURES ON CRYSTAL FIELD THEORY
Clyde A. Morrison Nov. 1982 123 p refs Presented at Recife, Brazil, 2 Nov. - 2 Dec. 1981
(AD-A122791; HDL-SR-82-8) Avail: NTIS HC A06/MF A01 CSCL 20/2

This report covers a series of lectures given from November 2 through December 2, 1981. The early work done at the Harry Diamond Laboratories (HDL) and the motivation for that work is given in the first lecture. Later lectures cover work done at HDL in the recent past as well as ongoing research. These latter lectures are interspersed with lectures which are intended to familiarize the audience with the notation employed at HDL. The last few lectures contain matter under investigation presently at HDL and other laboratories in the U.S. and Europe. GRA

N83-21999# Wisconsin Univ., Madison.
ELECTRONIC-STRUCTURE STUDIES OF METAL-HYDROGEN SYSTEMS USING PHOTOELECTRON SPECTROSCOPY (PES) RADIATION Final Report, 1 Mar. 1980 - 31 Aug. 1982
J. H. Weaver Sep. 1982 68 p refs
(Contract DE-AC02-80ER-10584)
(DE83-001373; DOE/ER-10584/1) Avail: NTIS HC A04/MF A01

Photoelectron spectroscopy studies of hydrogen bearing metals and alloys provided fundamental information concerning the electronic interactions of hydrides. Studies of surface oxidation of several hydrogen storage materials (the LaNi5-family) evaluated the role of surface oxidation on hydrogen uptake. Collaborative band theory studies were undertaken to support experimental studies of the metal semiconductor transition in LaH2-LaH3 and of the refractory metal mono- and submonohydrides. DOE

N83-22000# Sandia Labs., Albuquerque, N. Mex.
FUNDAMENTAL STUDIES OF GRAIN BOUNDARY PASSIVATION IN POLYCRYSTALLINE SILICON WITH APPLICATION TO IMPROVED PHOTOVOLTAIC DEVICES Research Report, Feb. 1981 - Jan. 1982
Carleton H. Seager and David S. Ginley Sep. 1982 59 p refs
(Contract DE-AC04-76DP-00789)
(DE83-000803; SAND-82-1701) Avail: NTIS HC A04/MF A01

Grain boundary barrier heights and other properties were measured on a variety of Wacker poly-Si to test the contention of Redfield that as received samples had no potential barriers and that temperature anneals activate the impurities in the boundaries. Our results show that these generalizations are not true and that a variety of barrier behaviors are found. Several of our new analytical techniques for studying grain boundaries and their passivation have been upgraded, including a new cell for Fourier Transform Infrared (FTIR) studies, electrochemical techniques, and a laser scanning apparatus for imaging grain boundaries. Grain boundaries in a variety of samples have been successfully passivated by the use of both the Kaufman ion source and a dc discharge apparatus. 20% improvements in cell efficiencies have been observed in large grained poly-Si cells, and the time of treatment has been drastically reduced. DOE

N83-22001# Los Alamos Scientific Lab., N. Mex.
MUON DIFFUSION IN NOBLE METALS
M. E. Schillaci, C. Boekema, R. H. Heffner, R. L. Hutson, M. Leon, C. E. Olson, S. A. Dodds, D. E. MacLaughlin, and P. M. Richards 1982 7 p refs Presented at the Intern. Symp. on the Electron. Struct. and Properties of Hydrogen, Richmond, 4-6 Mar. 1982 Prepared in cooperation with Rice Univ., California Univ., Riverside and Sandia Labs., Albuquerque, N. Mex.
(Contract W-7405-eng-36)
(DE82-011982; LA-UR-82-634; CONF-820325-8) Avail: NTIS HC A02/MF A01

Diffusion induced muon depolarization was measured in dilute AgGd and AgEr in the temperature range 200 to 700 K and have thereby determined the muon diffusion parameters in Ag. The diffusion parameters for positive muon in Cu, Ag, and Au are compared with those of hydrogen. For Ag and Au, the positive parameters are similar to those of hydrogen, whereas for Cu, the muon parameters are much smaller. Lattice activated tunneling and over barrier hopping are investigated with computational models. DOE

N83-22002# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
SURFACE AND SUBMICRON PHYSICS
H. A. Wright 1982 7 p refs Presented at the 15th Ann. Radiological Phys. Contractors Meeting, Gettysburg, Pa., 4 May 1982
(Contract W-7405-eng-26)
(DE82-015747; CONF-820575-6) Avail: NTIS HC A02/MF A01

Subjects discussed at the annual radiological/physics contractors meeting held in Gettysburg, Pa., 4 May 1982 are presented. The following research projects are briefly described: resonance ionization mass spectroscopy, an extreme uv transmission grating monochrometers, electron attenuation lengths in solids, surface enhanced Raman spectroscopy, and easy events in irradiated liquid water. L.F.M.

N83-22003# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
EXISTENCE OF WANNIER LADDER RESONANCES IN A SEMI-INFINITE CRYSTAL
F. Bentosela, V. Gecchi, and F. Zironi Dec. 1981 18 p refs
(DE82-903178; CNRS-CPT-81/P.1337) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Wannier resonances for a Kronig-Penney type model finite crystal in a finite range constant electric field are calculated. Stability is shown when the crystal is enlarged in one direction, getting in this manner the semi-infinite crystal resonances. As the field strength goes to zero, the width resonances decrease exponentially. States corresponding to resonance energies show spatial concentration as in the Zener theory. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N83-22004# West Virginia Univ., Morgantown. Dept. of Mathematics.
SENSITIVITY ANALYSIS OF THERMODYNAMIC CALCULATIONS
Caulton L. Irwin and Thomas J. OBrien (Morgantown Energy Technology Center) 1981 34 p refs Sponsored by DOE (DE83-004244; DOE/METC-82/53) Avail: NTIS HC A03/MF A01

Iterative solution methods and sensitivity analysis for mathematical models of chemical equilibrium are formally similar. For models which are a Newton-type iterative solution scheme, such as the NASA-Lewis CEC code or the R-Gibbs unit of ASPEN, it is shown that extensive sensitivity information is available for approximately the cost of one additional Newton iteration. All matrices and vectors required for implementation of first and second order sensitivity analysis in the CEC code are given in an appendix. A simple problem for which an analytical solution is possible is presented to illustrate the calculations and verify the computer calculations. DOE

N83-22005# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
EXPERIMENTAL STUDY OF THE THERMODYNAMICS OF THIN FILMS AND SURFACES Progress Report
E. D. Dahlberg and A. M. Goldman Nov. 1982 18 p refs (Contract DE-AC02-81ER-10887)
(DE83-003379; DOE/ER-10887/2) Avail: NTIS HC A02/MF A01

The development of semiconductor membrane calorimeters for the investigation of the thermodynamic properties of thin films and surfaces is discussed. The membranes are being formed using directional and selective etching techniques on semiconductor wafers. The procedures being developed to form calorimeters and to affix heaters, thermometers and electrical leads are a generalization of those used to fabricate Si membrane Josephson junctions. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N83-22006* National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT: A CONTINUING BIBLIOGRAPHY WITH INDEXES, MARCH 1983
Mar. 1983 225 p
(NASA-SP-7500(17); NAS 1.21:7500(17)) Avail: NTIS HC $20.50 CSCL 05A

This bibliography lists 960 reports, articles, and other documents introduced into the NASA scientific and technical information system in 1982. A.R.H.

N83-22007# National Advisory Committee on Oceans and Atmosphere, Washington, D.C.
FISHERIES FOR THE FUTURE: RESTRUCTURING THE GOVERNMENT-INDUSTRY PARTNERSHIP. NATIONAL OCEAN GOALS AND OBJECTIVES FOR THE 1980'S
Victoria J. Jones, ed. Jul. 1982 67 p refs
Avail: NTIS HC A04/MF A01

The Nation's ability to realize more fully the potential value of fisheries under U.S. jurisdiction is discussed. First, and of greatest significance, is the management and conservation of the fish stocks and the ecosystems in which they propagate and survive as juveniles and adults. It is in the national interest for the Federal Government to assume the responsibility of assuring the long term availability of high quality fishery habitat to provide a healthy medium in which to manage important stocks of fish. Carefully collected and interpreted data are a requisite base for effective habitat conservation and fishery management. The first goal, with objectives and recommendations, is presented as a framework in which government can guide the long term health of the Nation's living marine resources. S.L.

N83-22008# Institut fuer Sozialforschung und Sozialwirtschaft e.V., Saarbruecken (West Germany).
SOCIOLOGICAL ANALYSIS OF AN ORGANIZATIONAL DEVELOPMENT PROJECT CARRIED OUT AT INOVAN-STROEBE KG Final Report, May 1979
Bernd Hertel, Matthias Knuth, Hans Mittler, and Gerd Schank Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 516 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-010; ISSN-0171-7618) Avail: NTIS HC A22/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 68

An organizational development (OD) project carried out under the sole responsibility of an industrial firm (metal working, supplier of the electronics, electrical and optical industry, about 300 employees) with regard to the preconditions, conditions and problems involved was evaluated and a possible application of the chosen OD approach for companies was investigated. At the same time parameters were developed parallel to the OD process by sociological analysis of the working situation and firm organization for the humanization of working conditions within the context of the OD project. The following methods were used: participatory observation, interviewing, and the social and analytical approaches of work science. The findings indicate that the OD approach is based on theoretical and methodological preconditions which cannot adequately take into consideration the problems of humanizing working conditions in industry. This applies especially in correlating these problems with the technical and organizational work structures and the cooperational relationships as well as the specific interests as they exist in the interactional system of an industrial firm. The OD approach, which focusses on changes of personal attitudes and behavior, has the characteristics of a reorganizational and motivational strategy for industrial management to which the OD preconditions are more likely to be applied. S.L.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N83-22009 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
GUIDELINES FOR THE DESIGN OF LARGE MODULAR SCIENTIFIC LIBRARIES IN ADA Interim Report
G. T. Symm, B. Wichmann, J. Kok (Stichting Mathematisch Centrum), and D. T. Winter (Stichting Mathematisch Centrum) Nov.

1982 22 p refs Sponsored by EEC
(NPL-DITC-14/82; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The new programming language ADA was designed primarily for real-time computation. However, in view of the scale of effort invested in its design, it is generally expected that it will also be widely used in other areas, including the important one of large-scale scientific computation. Preliminary evaluations of the suitability of ADA for scientific computation indicate that several features of the language require careful consideration if large portable and modular scientific algorithms libraries are to be implemented successfully. Basic problems which face designers of large modular scientific libraries in ADA are outlined. Each problem area is discussed and solutions to the problems are derived through examples of ADA coding. L.F.M.

N83-22010* National Aeronautics and Space Administration, Washington, D. C.
DATA BASES AND DATA BASE SYSTEMS RELATED TO NASA'S AEROSPACE PROGRAM: A BIBLIOGRAPHY WITH INDEXES
1983 172 p
(NASA-SP-7048; NAS 1.21:7048) Avail: NTIS HC $17.50 CSCL 05B

This bibliography lists 641 reports, articles, and other documents introduced into the NASA scientific and technical information system during the period January 1, 1981 through June 30, 1982. The directory was compiled to assist in the location of numerical and factual data bases and data base handling and management systems. B.G.

N83-22011# Cologne Univ. (West Germany). Inst. for Applied Social Research.
PROBLEMS WITH THE USE OF PROCESS-PRODUCED DATA Final Report, Apr. 1981
Wolfgang Bick and Paul J. Mueller Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 149 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-001; ISSN-0170-8996) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31

Additional information which is required for the adequate use of process produced data (administrative data) within social science research and planning is reported. The kind of persons or agencies which possess such knowledge necessary for the interpretation of numerical process produced data are described. Recommendations for the further development of a social science source criticism and the development of data dissemination, data description, and responsiveness towards user needs are given. E.A.K.

N83-22012# Prognos A.G., Basel (West Germany). Abt. Wirtschaftspolitische Beratung.
INFORMATION AND COMMUNICATION TECHNOLOGY FOR THE SUPPLY OF INDUSTRIAL AND SCIENTIFIC INFORMATION IN THE 80'S: BOTTLENECKS AND SOLUTIONS Final Report, Dec. 1981
Heimfrid Wolff, Peter Hofer, Detlef Franzen, Richard Glazar, and Josef Kertesz Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 182 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-007; ISSN-0170-8996) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

The structuring of the interdependencies in the industrial and scientific information process between decision makers and their staff, professionals, publishers, information brokers, documentation centers, and libraries is discussed. Their special activities and their problems, their impact on the system of information supply for industrial and scientific purposes, and organizational and technical solutions (hard- and software) are analyzed. M.G.

N83-22013# Freie Univ., Berlin (West Germany). Arbeitsvereich Informations- und Dokumentationswissenschaft.
TOWARDS A NEW START IN USER RESEARCH. PRESENT SITUATION AND PERSPECTIVES OF THEORY AND METHODOLOGY OF USER RESEARCH IN INFORMATION AND DOCUMENTATION Final Report, Jun. 1981
Gernot Wersig, Gunther Windel, and Susanne Plagemann Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 112 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-009; ISSN-0170-8996) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany GM 23,50

Analysis of 50 empirical studies of theory and practice in user research shows major deficiencies. A plea is made for stronger integration of qualitative (representation-free) methods. The traditional approach rests mainly on a far reaching reduction of user research to user statistics and overemphazises the relation between user and system. Other relevant variables are neglected to a far extend. By adding only huge quantities of unrelated statistical data, a crude empiricism is revealed, lacking any theoretical and conceptual basis. Instead, a plea is made that user research should give priority to the single case. By analyzing a number of single cases, more generalizing conclusions could be drawn. A channel model is developed in which the traditional information agency is only one segment in a comprehensive communication process. The formalized segments of this process are named and placed into relation with each other. A.R.H.

N83-22014# Freie Univ., Berlin (West Germany). Leitstelle Politische Dokumentation.
STUDY ON THE SITUATION OF BIBLIOGRAPHIC WORK IN THE FIELD OF SOCIAL POLICY Final Report, Jun. 1981
Heiner Koch (Inst. fuer Arbeitsmarkt- u. Berufsforsch. der Bundesanstalt fuer Arbeit), Alfred Michler (Inst. fuer Arbeitsmarkt- u. Berufsforsch. der Bundesanstalt fuer Arbeit), and Norbert Walkiewicz Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 167 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-008; ISSN-0170-8996) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

The establishment of the Social Science Information System ('FiS Sozialwissenschaften') is discussed. An empirical analytic study shows that the state of bibliographic documentation in the field of social policy in 1980 forms the basis for a concept regarding the future organization of coordinated information and documentation services. An inquiry and interviews were made to complete the data collected. It is found that the size structure of establishments concerned with the special discipline social policy is heterogenous. There are usually a number of small institutions which are mostly responsible to greater organizational units with special duties. The demand for information of the potentially large number of users are mainly cover data, addresses and statistics. No central information and documentation services could be found for the sections consumer issues, social history and theory of social policy. The establishment of a coordinated unit aimed at improving the supply of services quantitatively and qualitatively at low cost is proposed. E.A.K.

N83-22015# Politecnico di Milano (Italy). Lab. di Calcolatori.
STATE DEPENDENCY ISSUES IN EVALUATING DISTRIBUTED DATABASE AVAILABILITY
F. A. Schreiber Nov. 1981 22 p refs Submitted for publication
(Rept-81-11) Avail: NTIS HC A02/MF A01

Quantitative evaluation of availability in distributed database systems must take into account both hardware and software failures. Therefore parameters such as the failure and the recovery probabilities must be evaluated for each component of the system. The most difficult problems arise when the evaluation procedure has to deal with failure mechanisms which functionally depend on the state of the system. After a short introduction to a general methodology for availability evaluation, an example of

state-dependent fault mechanism is described together with a technique for evaluating its impact on the life of the whole system. Author

N83-22016# Politecnico di Milano (Italy). Ist. di Elettrotecnica ed Elettronica.
A KNOWLEDGE-BASED CONSULTATION SYSTEM FOR AUTOMATIC MAINTENANCE AND REPAIR
Giuseppina Gini, Maria Gini, and Rosamaria Morpurgo 1982 10 p refs
Avail: NTIS HC A02/MF A01

Unmanned factor, or programmable flexible automation, is a common trend in industrial automation today. Many functions of flexible manufacturing systems now available can be controlled by computers. Manufacturing planning and control, managerial decision making, automated qualify control, automated maintenance, are examples of subsystems for which reliable and flexible software systems are not available. Some of the problems of CAM are explored and how Artificial Intelligence methods may offer good solutions are described. In particular it is demonstrated how expert systems can be applied in some industrial automation problems. A case study is then presented in which the general problem of maintenance (diagnosis and repair) is solved. Author

N83-22017# National Engineering Lab., East Kilbride (Scotland).
INDEX OF NATIONAL ENGINEERING LABORATORY (NEL) PUBLICATIONS, 1978-1980
Aug. 1982 36 p refs
(WEL-682) Avail: NTIS HC A03/MF A01

References with summaries are given for all reports and papers published during the years 1978 to 1980 by the staff of the National Engineering Laboratory (NEL); these are arranged by subject. Also included are lists of papers read at NEL symposia and conferences and a numerical list of NEL Reports with shortened summaries. Author

N83-22018# European Space Agency, Paris (France).
A GLOSSARY OF SPACE TERMS
Yves Taillefer and T. D. Guyenne, ed. Nov. 1982 435 p Partly in ENGLISH, FRENCH and GERMAN
(ESA-SP-1011; ISSN-0379-6566) Avail: NTIS HC A19/MF A01

Terms of interest to aerospace engineers and technicians are listed alphabetically in English with their French and German equivalents entered directly below in this 432 page machine-produced glossary of technical terms. Over 200 illustrations are included in addition to current definitions and context notations for most of the entries. A.R.H.

N83-22019# Naval Postgraduate School, Monterey, Calif.
A FUNCTIONAL COMPARISON OF THE NAVAL AVIATION LOGISTICS COMMAND MANAGEMENT INFORMATION SYSTEM (NALCOMIS) AND THE SHIPBOARD UNIFORM AUTOMATED DATA PROCESSING SYSTEM-REAL TIME (SUADPS-RT) M.S. Thesis
Syd W. Rodenbarger Jun. 1982 82 p refs
(AD-A122502) Avail: NTIS HC A05/MF A01 CSCL 15/5

Two important Management Information systems currently under development are the Naval Aviation Logistics Command Management Information System (NALCOMIS) and the Shipboard Uniform Automated Data Processing System-Real-Time (SUADPS-RT). Both of these systems address the functions of aviation supply support afloat and are envisioned for implementation on replacement state-of-the-art hardware being procured under the Shipboard Non-Tactical ADP Program (SNAP). Both systems are being developed as on-line, real-time MISs designed to provide maintenance and material managers with information concerning the management of aviation maintenance and supply support. This thesis investigates these two systems and determines those functional areas where duplication exists. Recommendations concerning the incorporation of the functional differences of the two systems are also provided. GRA

N83-22020# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
COMPARISON OF MICROPROCESSOR BASED DATA BASE MANAGEMENT SYSTEMS M.S. Thesis
Richard B. Relue Jun. 1982 92 p refs
(AD-A122464) Avail: NTIS HC A05/MF A01 CSCL 09/2

In this report two leading DBMS designs (DBASE II and MDBS III) are evaluated in terms of their design and performance on Altos computer systems. In addition some comments are made on their relative advantages and disadvantages for the average user. The basic conclusions reached are that the relational design of DBASE II is easier to use and apparently performs data manipulation problems better than MDBS III. In large scale applications where reliability and security are imperative, MDBS III is more appropriate since it provides crash recovery, access control, integrity constraints and other key features which DBASE II lacks. Author (GRA)

N83-22021# Oak Ridge National Lab., Tenn. Industrial Safety and Applied Health Physics Div.
PREPARATION OF COMPUTER DATA BASES FOR ENVIRONMENTAL PROTECTION
W. F. Ohnesorge, D. P. Carnes, and R. L. Haese 1982 4 p Presented at the UCC-ND and GAT Environ. Protection Seminar, Gatlinburg, Tenn., 5 Apr. 1982
(Contract W-7405-eng-26)
(DE82-013441; CONF-820418-16) Avail: NTIS HC A02/MF A01

Organizations which handle massive amounts of environmental data must use computer data bases to keep record costs as low as practicable and to make possible the efficient and timely assessment of the environment. The basic steps necessary for planning, programming, testing and documentation of a computer program are reviewed. DOE

N83-22022# California Univ., Berkeley. Dept. of Electrical Engineering and Computer Science.
A RULES SYSTEM FOR A RELATIONAL DATA BASE MANAGEMENT SYSTEM
Michael Stonebraker, Rowland Johnson (California Univ., Livermore, Lawrence Livermore Labs.), and Steven Rosenberg (California Univ., Berkeley, Lawrence Berkeley Labs.) 20 Apr. 1982 16 p refs Presented at the 2nd Intern. Conf. on Data Bases, Jerusalem, 22 Jun. 1982
(Contract W-7405-eng-48)
(DE82-014170; UCRL-87545; CONF-820637-1) Avail: NTIS HC A02/MF A01

The specification and proposed implementation of a rules system for a relational data base manager are presented. The motivation for this proposal is the fact that integrity constraints, protection, triggers, alerters, and views are all examples of special purpose rules systems. It is suggested that all five services can be obtained in one unified way through a single rules system. DOE

N83-22023# Oak Ridge Gaseous Diffusion Plant, Tenn. Computer Sciences Div.
ROUGH TUNING A COMPLEX DATABASE APPLICATION
Janis H. Foreman, Wesley M. Stephens, and Pamela B. Thomas 1982 14 p Presented at the Conf. on IDMS User Assoc. Database '82, Dallas, 18-21 Apr. 1982
(Contract W-7405-eng-26)
(DE82-008425; K/CSD/INF-82/3; CONF-820421-1) Avail: NTIS HC A02/MF A01

EMIS was on the drawing board as a 10-year project to a sophisticated integration of data from at least eight separate fields of engineering business information: (1) project information, (2) design man-hours, (3) engineering costs collection, (4) planning and scheduling, (5) design document information, (6) procurement information, (7) cost estimating information, and (8) construction data was provided. Each type of data was integrated into the system by: (1) siphoning data from existing systems into the EMIS data base, (2) replacing old systems with EMIS software, or (3) developing software when no existing software was available.

Primary emphasis for all software was toward project data. An additional desired feature was on-line terminal capabilities, with terminals scattered throughout the four plant sites. DOE

N83-22024# Technische Universitaet, Munich (West Germany). Inst. fuer Landwirtschaftlichen und Gaertnerischen Pflanzenbau.
APPLICATION OF DATA BANKS IN AGRICULTURE Final Report, Jun. 1981
Anton Mangstl and Ludwig Reiner Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-004; ISSN-0170-8996) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

The project "Application of Data Banks in Agriculture" consists of two parts. In the first part, a survey of data banks, data bases and information systems was computed which resulted in a documentation, that can be updated and printed by the computer at any time. In the second part, the feedback of information gained with field trials and field cards to the advisory service and the farmers was developed. The off line as well as on-line information interchange is fundamentally improved. E.A.K.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N83-22025*# Gellman Research Associates, Inc., Jenkintown, Pa.
ECONOMIC ANALYSIS OF AERONAUTICAL RESEARCH AND TECHNOLOGY Final Report
Aaron J. Gellman 30 Aug. 1982 147 p refs Sponsored in part by Executive Office of the President
(Contract NASw-3598)
(NASA-CR-170083; NAS 1.26:170083) Avail: NTIS HC A07/MF A01 CSCL 05C

The appropriateness of government intervention in the civilian market for aeronautics research and technology (R&T) is examined. The economic rationale for government intervention is examined. The conclusion is that the institutional role played by NASA in civilian aeronautics R&T markets is economically justified. Author

N83-22026# European Space Agency, Paris (France).
ECONOMIC BENEFITS OF ESA CONTRACTS: A SUMMARY
Oct. 1979 19 p Prepared in cooperation with Strasbourg Univ.
(ESA-BR-02; ISSN-0250-1589) Avail: NTIS HC A02/MF A01

The international space program for the years 1966 to 1977 is discussed. The European Space Agency procured scientific satellites, achieving advances in astronomy and geophysics; applications satellies, serving the practical ends of long-range telecommunications and meteorology; and sounding rockets. It also undertook the development of the first European heavy launcher, Ariane, which will soon be putting large communications satellites into geostationary orbit. Its latest and most ambitious endeavor is the procurement of Spacelab, Europe's first space laboratory, in which European scientists will be able to perform experiments outside the Earth's atmosphere. Author

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N83-22027# Committee on Science and Technology (U. S. House).
IMPACT OF NATIONAL SECURITY CONSIDERATIONS ON SCIENCE AND TECHNOLOGY
Washington GPO 1982 272 p refs Hearing before the Subcomm. on Sci., Res. and Technol. and the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 2d Sess., no. 110, 29 Mar. 1982
(GPO-97-341) Avail: Subcommittee on Science, Research and Technology

The impact on science and technology of proposals for increased control of potentially sensitive technology and scientific data is determined. The proposals for tightening control over scientific exchanges, the export of technology, and the free flow of information are being put forth in the name of national security. Plans for the protection of the flow of information without suppressing legitimate and necessary scientific exchange are investigated. S.L.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N83-22028*# Department of Transportation, Cambridge, Mass. Transportation Systems Center.
FUEL ECONOMY AND EXHAUST EMISSIONS CHARACTERISTICS OF DIESEL VEHICLES: TEST RESULTS OF A PROTOTYPE CHRYSLER VOLARE, 225 CID (3.7-LITER) AUTOMOBILE Final Report, Jan. - Jun. 1981
R. A. Walter Jul. 1982 45 p refs
(Contract DE-AI01-80CS-50194)
(NASA-CR-167925; DOE/NASA/2817-3; DOT/TSC-NASA-82-3; NAS 1.26:167925) Avail: NTIS HC A03/MF A01 CSCL 13F

The results obtained from fuel economy and emission tests conducted on a prototype Chrysler Volare diesel vehicle are documented. The vehicle was tested on a chassis dynamometer over selected drive cycles and steady-state conditions. The fuel used, was a DOE/BETC referee fuel. Particulate emission rates were calculated from dilution tunnel measurements and large volume particulate samples were collected for biological and chemical analysis. The vehicle obtained 32.7 mpg for the FTP urban cycle and 48.8 mpg for the highway cycle. The emissions rates were 0.42/1.58/1.17/0.28 g/mile of HC, CO, NOx and particulates respectively. Author

N83-22029*# Little (Arthur D.), Inc., Cambridge, Mass.
STIRLING ENGINE APPLICATION STUDY Final Report
W. P. Teagan and D. Cunningham Mar. 1983 261 p refs
(Contracts DEN3-254; DE-AI01-77CS-51040)
(NASA-CR-168087; DOE/NASA/0254-1; NAS 1.26:168087) Avail: NTIS HC A12/MF A01 CSCL 10B

A range of potential applications for Stirling engines in the power range from 0.5 to 5000 hp is surveyed. Over one hundred such engine applications are grouped into a small number of classes (10), with the application in each class having a high degree of commonality in technical performance and cost requirements. A review of conventional engines (usually spark ignition or Diesel) was then undertaken to determine the degree to which commercial engine practice now serves the needs of the application classes and to detemine the nature of the competition faced by a new engine system. In each application class the Stirling engine was compared to the conventional engines, assuming that objectives of ongoing Stirling engine development programs are met. This ranking process indicated that Stirling engines showed potential for use in all application classes except very light duty applications (lawn mowers, etc.). However, this potential is contingent on demonstrating much greater operating life and reliability than has been demonstrated to date by developmental Stirling engine systems. This implies that future program initiatives in developing Stirling engine systems should give more emphasis to life and reliability issues than has been the case in ongoing programs. Author

N83-22030# California Univ., Livermore. Lawrence Livermore Lab. Transportation Systems Research Div.
ROADWAY-POWERED ELECTRIC-VEHICLE IMPACT STUDY ANALYSIS OF SELECTED UTILITY-SERVICE AREAS
V. Robert Latorre and Leo R. Spogen Sep. 1982 85 p refs
(Contract W-7405-eng-48)
(DE83-003143; UCID-19591) Avail: NTIS HC A05/MF A01

A Roadway Powered Electric Vehicle (RPEV) derives energy needed for propulsion from two sources. It derives energy from the roadway by magnetic coupling and uses onboard stored energy when off the powered roadway. Possible candidates for supplying needed onboard energy are a secondary battery and an internal combustion engine. When miles normally traveled by internal combustion engine vehicles (ICEV) are replaced by RPEV travel, petroleum consumed (if any) in generating electrical energy for the roadway and for recharge of secondary batteries may be less than that which would be consumed by the ICEV. Thus, a savings in petroleum may result. The price paid for this savings may be an impact on the operating margins of the utilities supplying the electrical energy. Petroleum savings and utility impact results from RPEV usage in areas serviced by ten US utilities. Careful selection of the utilities analyzed has led to a spectrum of results. DOE

N83-22031# Tennessee Valley Authority, Chattanooga. Transportation Projects.
TEST AND EVALUATION REPORT FOR THE GRUMMAN-OLSON KURBWATT
J. K. Metcalfe, G. D. Whithead, and R. L. Driggans 1982 93 p Sponsored by EPRI
(EPRI Proj. 1136-5)
(DE83-900052; TVA/PUB-82/6) Avail: NTIS HC A05/MF A01

The results obtained from tests performed on the Kurbwatt, an electric vehicle are documented. Data on vehicle physical characteristics and performance acquired during tests conducted under test track, dynamometer, and on-road conditions are presented along with descriptions of the vehicle and its components and information on the reliability of the vehicle during the test period. DOE

N83-22032# California Univ., Livermore. Lawrence Livermore Lab.
INDUCTIVE POWER TRANSFER FOR PROPULSION
C. E. Walter 14 Jan. 1982 14 p refs Presented at the 61st Ann. Meeting of the Transportation Research Board, Washington, 18 Jan. 1982
(Contract W-7405-eng-48)
(DE82-008246; UCRL-87108; CONF-820128-2) Avail: NTIS HC A02/MF A01

Application of the concept of inductive power transfer to propulsion of buses, automobiles, and trucks can contribute to a quality national transportation system. The concept is basically an air gap transformer which inductively couples the primary in the roadway to the secondary suspended beneath the vehicle. Power is transferred efficiently in this manner and can be used in an electric motor for propulsion. Investigations include a detailed experimental program, evaluation of the impact on electrical utility generating capacity and early applications in transit. DOE

N83-22033# Institut de Recherche des Transports, Arcueil (France). Centre d'Evaluation et de Recherche des Nuisances et de l'Energie.
MOTORIZED TWO-WHEELERS
Georges Pachiaudi, Francois Gerin (Direc. des Routes et de la Circulation Routiere), Jean Delsey, Jacques Lambert, Dominiquee Cesari (Organ. Natl. de Securite Routiere), Jean-Louis Favero (Soc. d'Etudes et de Realisations Automobiles C.D.), and Gilles Schafer (Soc. d'Etudes et de Realisations Automobiles C.D.) Sep. 1982 140 p refs In FRENCH; ENGLISH summary
(Note-dInform-21; ISBN-2-85782-091-7; ISSN-0339-8676) Avail: NTIS HC A07/MF A01

Statistical data upon the vehicle ownership of motorized two-wheelers and their evolution during the last few years are given for the French domestic market and the French production of these business or leisure vehicle. After a review of the different types and categories of motorized two-wheelers and their regulations, the design characteristic of these vehicles and the currently used technology are described. Operating parameters, fuel consumption, and the safety aspect are addressed. Solutions are proposed in order to reduce the frequency and gravity of accidents. The difficult problem of the dynamic balance of motorized two-wheelers is covered. Author

88 SPACE SCIENCES (GENERAL)

N83-22034# European Space Agency, Paris (France). Space Science Dept.
THE SCIENTIFIC IMPORTANCE OF SUBMILLIMETRE OBSERVATIONS
T. DeGraauw, comp. and T. D. Guyenne, comp. Aug. 1982 237 p refs Proc. of Workshop, Noordwijkerhout, Netherland., 10-12 May 1982
(ESA-SP-189; ISSN-0379-6566) Avail: NTIS HC A11/MF A01

Advances in the planning and construction of mm and submm wave telescope facilities and considerations on the feasibility of submm space borne observatories needed to overcome the serious limitations imposed by the Earth's atmosphere are addressed. High frequency transitions, cloud models, continuum-solar system, and instrumentation are among the topics discussed. For individual titles, see N83-22035 through N83-22072.

N83-22035# Queen Mary Coll., London (England). Dept. of Physics.
RECENT SUBMILLIMETRE WAVELENGTH STUDIES OF MOLECULES IN STAR FORMATION REGIONS **c89**
G. J. White *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 5-11 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

The recent availability of sensitive heterodyne detectors in the submillimetre spectral region (300-1000 GHz) and large aperture optical infrared telescopes at high altitude observatories have led to sensitive astronomical observations of a number of molecular species in galactic star formation regions. The current state of progress in this newly developing field is examined both with regard to present day detectors and also astrophysiscal applications Author

N83-22036# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE ROTATIONAL POPULATIONS AND ABUNDANCES OF INTERSTELLAR C2 AND C2H **c90**
J. H. Black and E. F. vanDishoeck (Sterrewacht, Leiden) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 13-20 refs Sponsored by Netherlands Organization for the Advancement of Pure Research (For primary document see N83-22034 11-88)
(Grant NSF AST-81-14718)
Avail: NTIS HC A11/MF A01

The excitation of the diatomic carbon molecule in interstellar clouds is discussed with attention to the probabilities for the radiative and collision al excitation processes. The rotational temperature is computed to be generally higher than the kinetic temperature, as is found in existing interstellar absorption line observations of C2. The rotational populations can be used as a diagnostic probe of local temperature, density and strength of the radiation field, although all three parameters cannot usually be extracted from C2 data. An unusual radio frequency spectrum of C2 is predicted. The abundances of C2 and C2H in the interstellar cloud are discussed and brightness temperatures for C2H in this cloud are computed. Author

N83-22037# Cologne Univ. (West Germany). Physikalisches Inst.

INTERSTELLAR HYBRIDES **c90**
G. Winnewisser, M. R. Aliev, and K. Yamada *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 23-28 refs Sponsored by Deutsche Forschungsmeinschaft (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

The great progress molecular astronomy has made in the past decade has focused attention to one special class of molecules: the hydrides. The presently known spectra of the hydrides are reviewed, both interstellar and laboratory. No interstellar metal hydrides are presently known. A large number of important hydrides exhibit spectra only in the submillimetre and far infrared region. Further technical advances in this area are expected to yield new interstellar detections. Author

N83-22038# Mullard Radio Astronomy Observatory, Cambridge (England).
SUBMILLIMETRE SPECTRAL LINE OBSERVATIONS AND CONDENSATIONS IN MOLECULAR CLOUDS **c89**
R. Padman *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 29-30 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

An unresolved uniform isothermal contracting gas cloud has maximum emission in any molecular line over a range of densities defined at the lower end by the requirement for thermalization by collisions and at the other end by the need for the optical depth to be less than or approximately equal to 1. This makes it likely that with relatively low sensitivity fragments will only be detected with densities close to the critical density. However, present day instruments such as UKIRT are approaching sensitivities at which it will be just possible to detect clumps with masses of between 0.1 and 1 solar mass. A slightly more massive clump may already have been detected in OMC1, and is possibly associated with H2O maser emission. Author

N83-22039# Turin Univ. (Italy). Ist. di Fisica Generale.
HIGH-EXCITATION ROTATIONAL MOLECULAR LINES FROM DENSE INTERSTELLAR CLOUDS **c90**
G. Silvestro and A. Ferrari *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 31-32 refs Prepared in cooperation with CNR, Turin (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A simple mode is presented for evaluating the intensities of carbon monoxide rotational lines from dense molecular clouds. The calculations are performed for optically thin lines and a thermal distribution in the level population, in agreement with data on the observed high transitions. The calculated brightness temperatures seem to allow observational detection. Author

N83-22040# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE SO 2 SUB 3 - 1 SUB 2 EMISSION IN ORION A **c93**
J. P. Phillips and G. J. Whije (Queen Mary Coll.) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 33-36 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Orion A is one of the nearest and best studied regions of star formation, the strongest CO source so far detected, and a particularly fruitful region in the search for new and ever more exotic molecules. A stellar wind, with genesis in some newly formed or forming star, is being power driven into a surrounding placental cloud. The resulting shocks lead to densities of order 1 x 10 to the 6th power 1/cu cm or higher, and gas kinetic temperatures T approximately 2000 K, causing excitation of H2 quadrupole emission in the near infrared and the higher rotational transitions of CO in the far-infrared. Author

N83-22041# Massachusetts Univ., Amherst. Five College Radio Astronomy Obs.
HIGH-VELOCITY EMISSION IN THE ORION MOLECULAR CLOUD **c90**
P. F. Goldsmith *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 37-41 refs Sponsored by the Commonwealth of Massachusetts (For primary document see N83-22034 11-88)
(Grant NSF AST-81-21481)
Avail: NTIS HC A11/MF A01

The millimeter, submillimeter, and far infrared observations of carbon monoxide in the core of the Orion molecular cloud were summarized. The data indicate that there is a bipolar outflow producing emission at velocities exceeding 50 km/s from the centroid of the line profiles. The alignment of the axis of the bipolar flow suggest that this outflow is responsible for the shock excitation of the H2 in a surrounding shell. A substantial optical depth in the lower transitions is indicated by the detection of carbon 13 monoxide emission in the high velocity wings in the millimeter transitions, as well as by chemical models and estimates of the CO column density in this region. B.G.

N83-22042*# California Inst. of Tech., Pasadena.
SUBMILLIMETRE OBSERVATIONS OF ATOMIC CARBON **c89**
T. G. Phillips and Jocelyn Keene *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 45-49 refs (For primary document see N83-22034 11-88)
(Grant NAG2-1)
Avail: NTIS HC A11/MF A01 CSCL 03A

Emission from the ground state fine structure transition of atomic carbon at 610 microns has been observed in Galactic sources. From comparison of the observations with CO emission, it can be deduced that the abundance of neutral carbon relative to CO is high (approximately 0.1-3). The spatial and velocity distribution of CI and CO are often very similar. If molecular clouds are older than 1 x 10 to the 6th power years, the observations necessitate a mechanism which can maintain a high abundance of neutral carbon in cloud material, either by hindering complete conversion of C into CO or by physically and chemically rejuvenating the material. Author

N83-22043# Mullard Radio Astronomy Observatory, Cambridge (England).
STATUS REPORT ON THE UK-NL 15-METRE TELESCOPE **c89**
R. Hills *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 51-52 (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

The key features of the telescope are its homologous structure, designed to minimize the effects of gravitational deformations, the use of an enclosure to reduce wind forces and thermal disturbances, the fabrication of the panels by replication from highly accurate moulds and the setting of the surface using a laser measuring machine. The continuing experimental and analytical work in all of these areas has provided a high degree of confidence that the specified surface accuracy of 50 microns rms will be achieved under all observing conditions and that the goal of 35 microns rms will be reached in favourable circumstances. Author

N83-22044# Cologne Univ. (West Germany). Physikalisches Inst.
THE COLOGNE 3-M MILLIMETRE AND SUBMILLIMETRE RADIO TELESCOPE **c89**
G. Winnewisser, M. Bester, E. Pofahl, M. Olberg, G. Rau, W. Zensen, P. Wratil, and B. Vowinkel *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 53-57 refs Sponsored by Deutsche Forschungsmeinschaft (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A 3 m radiotelescope with a surface accuracy of better than 50 microns (rms) is presently being constructed. The telescope will be used mainly for molecular line work, and is expected to be usable to a shortest wavelength of about 0.5 mm. It is being equipped with a cryogenic Schottky barrier mixer, operating initially in the 90 GHz band. A 256 channel (1 MHz/channel) filter spectrometer and high resolution (40 kHz/channel)

acousto-optic spectrometer will be used for spectral analysis. The various telescope control functions will be carried out by microprocessors, controlled by a PDP 11/34 computer. The entire system is expected to be in operation early 1983. Author

N83-22045# Grenoble Univ. (France). Groupe d'Astrophysique du CNRS.
PROJECTED INSTALLATION OF A 2.5m ANTENNA ON THE PLATEAU DE BURE FOR 1.3m OBSERVATIONS c89
R. Lucas *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 59-60 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

The installation of a minitelescope for study of interstellar molecular clouds on a good mountain site of easy access, working at higher frequency in the 1.3 mm window is outlined. Installation of a 2.5 m antenna on the Plateau de Bure is planned, to be operated at 1.3 mm wavelength for observations of molecular clouds, mostly in the J = 2-1 line of CO and isotopes. E.A.K.

N83-22046# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
A 10m TELESCOPE FOR SUBMILLIMETRE ASTRONOMY c89
J. W. M. Baars and P. C. Mezger *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 61-62 refs Sponsored by Max-Planck Society, Alfred Krupp van Bohlen und Halbach Foundation and Ariz. Univ. (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Several atmospheric transmission windows between 350 micro m and 3 mm wavelength which allow astronomical observations from a sufficiently high and dry mountain site are examined. The design of a telescope for the sub mm wavelength region, which will exhibit full performance at 350 micro m is outlined. The diameter of the reflector is approximately 10 m, the surface accuracy is < 15 micro m and the pointing accuracy 1'. Extensive use of carbon fiber reinforced plastic enables a light and stiff construction without significant thermal deformations. E.A.K.

N83-22047# Turin Univ. (Italy). Ist. di Fisica Generale.
A PROJECT FOR A MILLIMETRE WAVE INTERFEROMETER NEAR MATTERHORN c35
G. Silverstro *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 63-64 refs Prepared in Cooperation with CNR, Turin (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A project for an interferometer involving the Alpine stations at Testa Grigia and Gornergrat is described. Millimeter wave astronomy has poor angular resolution compared with both optical and radio astronomy. Many fundamental problems of galactic astronomy require greatly increased resolution in the mm wave band, which is obtained by an interferometric system. The project makes it possible to obtain very high resolution observations of compact millimeter sources. The system expected performance is estimated. E.A.K.

N83-22048*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
PROGRESS IN AIRBORNE INFRARED AND SUBMILLIMETRE SPECTROSCOPY c89
M. Harwit *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 65-67 refs (For primary document see N83-22034 11-88)
(Grants NsG-2347; NGR-33-010-146)
Avail: NTIS HC A11/MF A01 CSCL 03A

The role of spectral resolution and of instrumental sensitivity in astronomical spectroscopy conducted from aircraft is discussed. One cause of difficulty in changing atmospheric transmission is the variations in water vapor content above the aircraft. A main source of uncertainty in measurements is the modulation of the observed signal. E.A.K.

N83-22049# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Space Research Group.
ASTROPLANE: A EUROPEAN RESEARCH AIRCRAFT FOR IR AND SUBMILLIMETRE ASTRONOMY (THE DFVLR PROPOSAL) c89
C. B. Cosmovici, E. Schmidt, and U. Stanggassinger *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 69-79 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A proposal for an European Aircraft carrying a competititve infrared submillimeter telescope on board is presented. The need for an Astroplane is pointed out. A Challenger 601 Aircraft as carrier for a 120 cm telescope is proposed. New concepts for a light weight updated airborne astrolaboratory are presented. E.A.K.

N83-22050# European Space Research and Technology Center, Noordwijk (Netherlands). Astronomy Div.
INFRARED SPACE OBSERVATORY (ISO): AN ESA STUDY OF A CRYOGENICALLY-COOLED TELESCOPE IN SPACE FOR INFRARED ASTRONOMY c89
R. Emery *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 81-87 refs Previously announced in IAA as A83-17429 (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

An ESA study for an infrared observatory facility in space is described. It consists of a 60 cm diameter cooled telescope with a range of spectroscopic and photometric instrumentation, mounted on a 3 axis stabilized platform. It will be launched into a 12 hour elliptical orbit using Ariane, and is designed to have a lifetime of at least 1.5 years. E.A.K.

N83-22051*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUBMILLIMETRE ASTRONOMY FROM SPACE PLATFORMS c89
T. B. H. Kuiper and D. J. Hollenbach (NASA. Ames Research Center) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 ap 91-96 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01 CSCL 03A

The scientific need and the technical feasibility of a 10-m class far infrared telescope in space were studied and culminated in the recommendation of the large deployable reflector (LDR). The scientific considerations for such a project are described and the general characteristics of LDR are derived. A scientific program culminating in LDR is suggested. E.A.K.

N83-22052# European Space Research and Technology Center, Noordwijk (Netherlands). Astronomy Div.
HETERODYNE INSTRUMENTATION FOR SPACE c89
T. deGraaw *In* ESA The Sci. Importance of Submillimetr Observations Aug. 1982 p 97-98 (For primary document se N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A development program submillimeter heterodyne components and instrumentation for applications in space is discussed. Critical areas of a space heterodyne receiver, operating between 300 and 500 GHz, were identified. E.A.K.

N83-22053*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A CONCEPT FOR AN ORBITING SUBMILLIMETRE-INFRARED OBSERVATORY c89
P. N. Swanson and M. Kiya (NASA. Ames Research Center) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 99-105 refs (For primary document see N83-22034 11-88)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 03A

A large submillimeter and far infrared orbiting astronomical observatory were designed. The operating wavelength will be between 1 mm (1000 micro m) and 30 micro m. The short wavelength limit is a compromise between the point where smaller,

cooled telescopes become more sensitive and practical technology. The short wavelength limit may be increased if the tradeoff between cost and scientific return is advantageous. E.A.K.

N83-22054# Texas Univ., Austin. Dept. of Astronomy.
CLOUD MODELING WITH MILLIMETRE TRANSITIONS: IMPLICATIONS FOR SUBMILLIMETRE OBSERVATIONS c90
P. A. VandenBout *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 109-113 refs (For primary document see N83-22034 11-88)
(Grant NSF AST-81-16403)
Avail: NTIS HC A11/MF A01

The implications of spectral line observations in the frequency range 200-350 GHz for techniques which infer physical properties of galactic molecular clouds are reviewed. Millimeter observations at high frequencies have made it possible to study several transitions of abundant molecules which improved the determination of temperatures and densities. The submillimeter region is an advantageous and powerful extension. E.A.K.

N83-22055# Amsterdam Univ. (Netherlands). Inst. of Astronomy.
PREDICTIONS OF LINE INTENSITIES FROM HYDROSTATIC MODELS OF MOLECULAR CLOUDS c90
W. Boland *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 115-117 refs Sponsored by Netherlands Foundation for Astronomical Research and Netherlands Organization for Advancement of Pure Research. (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Plane parallel and spherical models of cold dense molecular clouds were constructed. The gas is heated predominantly by photoelectrons from dust grains in the outer parts of the clouds and by cosmic ray ionizations of molecular hydrogen in the inner parts. It is cooled by fine structure excitation followed by radiative decay of C+ ions and c atoms in the outer parts of the clouds and by rotational excitation of CO molecules followed by radiative decay in the inner parts. The brightness temperatures of several millimeter and submillimeter lines of C+, C, CO and HCO for our spherical cloud models are calculated. Observations in the directions of L134 and L183 are compared. E.A.K.

N83-22056# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
DETAILED MODELS OF MOLECULAR CLOUDS WITH AND WITHOUT MASSIVE STAR FORMATION c90
L. G. Stenholm *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 119-122 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Detailed observationally determined models of molecular clouds with and without massive star formation are discussed. The assumption on which the models are based is discussed as well as the question of uniqueness. It is shown that the cloud structures can be explained by gravitational, magnetic and radiative processes. Further the differences between the clouds seem to be due to the initial values of cloud mass, cloud radius and the ratio of gravitational to magnetic energy. R.J.F.

N83-22057# Ecole Normale Superieure, Paris (France). Lab. de Physique.
DYNAMICAL STRUCTURE OF REGIONS OF INTERMEDIATE-MASS STAR FORMATION c90
F. Falgarone, J. L. Puget, and M. Perault *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 123-128 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Several clouds associated with nearby molecular complexes, moderately bright in the far infrared and characterized by an infrared excess (IRE) > 100 and a low L/M ratio were identified. These clouds may therefore be representative of a long lasting phase of the local interstellar medium. Their mass is found to be concentrated in condensations of a few 100 solar masses plowing into an ambient gas with a 3-d velocity dispersion approximately 10 km s-1. The lifetime of such a configuration can be significantly increased if the ambient gas is hot and rarefied. It is shown that the ambient medium can be maintained at T sub k approximately 10,000 K for a few 10 to the eighth power years, heated mainly by the kinetic energy losses of the condensations, the ultimate energy source being the gravitaional potential energy of the whole cloud in a state of virialized contraction. R.J.F.

N83-22058*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Systems Div.
WATER AS A PROBE OF STAR-FORMING REGIONS c90
E. N. Rodriguez-Kuiper (Bell Aerospace Systems Div., Huntington Beach, Calif.) and T. B. H. Kuiper *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 129-130 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01 CSCL 03B

Preliminary calculations employing statistical equilibrium techniques were carried out to determine brightness temperatures of water transitions occurring in the submillimeter band. The interesting candidates appear to be the 325 GHz, 380 GHz, and 448 GHz transitions, they are compared with the 183 GHz and 380 GHz transitions observed in the Orion Kleinmann-Low nebula and the combined results seem to be consistent with H2 densities of 100,000 -1 million cm-3 and a water column density of approximately 10 to 18th power. This implies a relative abundance of approximately 0.00001 which means that water may be about one twentieth of CO. In addition, it was found that for the conditions of the Orion plateau source, the 448 GHz line is expected to be a mild maser. R.J.F.

N83-22059# Stockholm Univ. (Sweden).
OBSERVATIONS OF THE J=3-2 AND 1-0 TRANSITIONS OF HCO+ IN NGC2071 CEP MC-1 AND W3 c89
A. Sandqvist, R. B. Loren (Millimetre Wave Obs., Fort Davis, Tex.), A. Wootten (Rensselaer Polytech. Inst.), P. Friberg (Onsala Space Observatory, Sweden), and A. Hjalmarson (Onsala Space Observatory, Sweden) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 131-134 refs Sponsored by Swedish Natural Science Research Council, Swedish Board for Technical Development (For primary document see N83-22034 11-88)
(Grants NSF AST-79-16815; NSF AST-79-20966)
Avail: NTIS HC A11/MF A01

Three molecular clouds with regions of star formation, NGC 2071, Cep MC-1 and W3, are studied through observations of three transitions of HCO+ and H13CO+ with different telescopes, yielding comparable resolution in the respective transitions. The J = 1-0 transition was observed using the Onsala Space Observatory 20 m telescope with a resolution of 42 inches, and the U.S. National Radio Astronomy Observatory 11 m telescope at Kitt Peak with a resolution of 76 inches. The J = 3-2 transition was observed with the Millimeter Wave Observatory 5 m telescope in Texas with a resolution of 72 inches. R.J.F.

N83-22060# Manchester Univ. (England). Inst. of Science and Technology.
A TIME-DEPENDENT MODEL FOR THE CHEMICAL COMPOSITION OF INTERSTELLAR MOLECULAR CLOUDS c90
G. D. Watt and D. A. Williams *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 135-140 refs Sponsored by SRC (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A computer program was constructed to deal with the time-dependent integration of molecular species formation in a variety of interstellar clouds. The data contains over 1400 chemical reactions for the formation and destruction of 89 different molecular species. We have found that over a large range of cloud density and kinetic temperature the resultant chemical abundances reach a steady-state equilibrium value by 10 to the 7th power years or less. The approach to this equilibrium is a highly sensitive function of the initial elemental abundances. Preliminary investigations using time-dependent methods with constant temperature and density models were compared with equilibrium results from time-

dependent models and the results are in satisfactory agreement. The model is currently being modified to deal with the rapidly changing temperature and density conditions occurring behind an interstellar shock front, and the resulting effects on the chemistry. R.J.F.

N83-22061# Preston Polytechnic (England). Div. of Physics and Astronomy.

CONTINUUM OBSERVATIONS OF EXTRAGALACTIC SOURCES **c89**

E. I. Robson *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 147-455 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

The current status of one millimeter and submillimeter continuum observations of extragalactic sources is presented. Discussions of systems, sensitivities, detection achievements and calibration techniques are given. Three categories of extragalactic programmes are selected and the scientific importance of submillimeter observations is explained for each. Author

N83-22062# Ecole Normale Superieure, Paris (France). Lab. de Physique.

SUBMILLIMETRE CONTINUUM EMISSION OF THE GALAXY **c93**

J. L. Puget *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 157-166 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

The main properties of the thermal emission of interstellar dust are summarized. Then a review of the most recent submillimeter surveys is given with special emphasis on a detailed comparison of data obtained at the same wavelength. The main theoretical problem is the origin of the unresolved component detected from the near infra-red up to 1 mm. The two models proposed so far: a really diffuse source associated with the low density ionized medium or the sum of extended sources associated with giant-molecular clouds- HII regions complexes are discussed and the data used to try to distinguish between these two models. Author

N83-22063# Observatoire de Paris-Meudon (France).

OBSERVATION OF GIANT PLANETS AND COMETS IN THE FAR INFRARED AND SUBMILLIMETERIC RANGE **c89**

T. Encrenaz, M. Combes, and J. Crovisier *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 167-173 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

A brief review of the existing observations is presented for the four Giant Planets and Titan. Some possible experiments - spaceborne, airborne or ground-based - to be performed in the future on Giant Planets, on bright comets and on Titan are discussed. R.J.F.

N83-22064# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Dept. of Physics.

SUBMILLIMETRE-WAVE BRIGHTNESS TEMPERATURES OF SOLAR ACTIVE ZONES AND SUNSPOTS MEASURED FROM A BALLOON-BORNE PLATFORM **c92**

F. Carrier, F. K. Kneubuenl, D. Huguenin (Geneva Observatory), and E. A. Mueller (Geneva Observatory) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 175-179 refs Sponsored by Swiss Natural Science Foundation and Geneva Obs. (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

Submillimeter-wave brightness temperatures of the quiet Sun, sunspot regions and solar active zones were measured with the aid of balloon-borne 60 cm-diameter Cassegrain telescope from a height of 38 km on May 8, 1981. An average temperature increase of about 200 K at active zones and near sunspots above the temperature of the quiet Sun at 200 microns wavelength which corresponds to the lowest part of the chromosphere was found. On the other hand, this increase is only about 80 K observe at 80 microns in the upper photosphere. R.J.F.

N83-22065# Groningen Rijksuniversiteit (Netherlands). Kapteyn Astronomical Inst.

FAR INFRARED CRYOGENIC SPECTROMETERS **c35**

J. J. Wijnbergen *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 183-187 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

The basic ideas behind the development of cryogenic spectrometers in the far infrared are explained. A number of instruments constructed in the last decade are discussed. Finally two successful spectrometers and a Fabry-Perot are discussed in more detail. R.J.F.

N83-22066# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestriche Physik.

HETEORODYNE SPECTROMETER FOR 10 MICRONS WORKING IN THE CASSEGRAIN FOCUS OF ASTRONOMICAL TELESCOPES **c35**

H. Rothermel and H. U. Kaeufl *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 189-196 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

A quasi-optical receiver is using a grating tunable CO2 laser as local oscillator and a photovoltaic detector for frontend mixing. The sensitivity of this system is approaching the quantum noise limit. The bandwidth (2 GHz) is sufficient for high resolving spectroscopy at selected astronomical objects. For illustration a subdoppler emission of Mars measured with a resolution of 5,000,000 will be shown, which was obtained with the 2.2 m mirror on Calar Alto in April '82. The optical section, high frequency section, filter section, synchronous detection in 30 parallel channels and data reduction are presented at the block diagram level. An electrooptical modulator operative between 18 and 26 GHz to be incorporated for the next observation period allows for additional laser tunability. Author

N83-22067# Astronomical Inst., Utrecht (Netherlands).

DESIGN OF ACOUSTO-OPTICAL SPECTROMETERS **c35**

H. vandeStadt, J. A. Lindenbergh, and J. Claas *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 197-199 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

A small, stable and low cost acousto-optical spectrometers for millimeter wave observations has been designed at the Astronomical Institute of Utrecht. The instrument has 2048 frequency channels in two bands with resolutions of 900 kHz and 125 kHz in overall bandwidths of 500 MHz and 50 MHz, respectively. The spectrometer fits in a 19 inch rack and we will describe the special measures to achieve high stability and high dynamic range. Author

N83-22068# Onsala Space Observatory (Sweden).

SUPERCONDUCTING MIXERS **c35**

E. Kollberg *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 201-202 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

A very short review with results on superconducting quasiparticle, Josephson and Super-Schottky mixers is presented. Author

N83-22069# Groningen Rijksuniversiteit (Netherlands). Dept. of Space Research.

A 185 GHz JOSEPHSON POINT-CONTACT LOW-NOISE MIXER

G. terHorst, H. Schaeffer, and T. Poorter *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 203-205 refs (For primary document see N83-22034 11-88)

Avail: NTIS HC A11/MF A01

The performance of a Josephson mixer at 185 GHz is reported. At 185 GHz the best single side band (SSB) mixer temperature was 160 K with a SSB conversion loss of 4.4 dB. The associated total receiver temperature (SSB) is found to be 415 K. The instantaneous bandwidth is 20 GHz. Author

N83-22070# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
LOWER-NOISE MOTT DIODES FOR CRYOGENIC MIXERS AT SUBMILLIMETRE WAVELENGTHS **c35**
J. Keen *In* Esa The Sci. Importance of Submillimetre Observations Aug. 1982 p 207-211 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

Computations on a diode model show that improvements in epitaxial doping profiles for Mott diodes should lead to marked reductions in cooled mixer noise temperatures. It is found that the ideality factor deduced from I-V characteristics is scarcely useful in predicting cooled mixer operation, but that the i.f. noise generated by the d.c. biased diode can reasonably predict performance. Calculations of excess hot-electron noise suggest that diodes should begin to show significant hot electron noise as diameters are reduced, since TEXCESS approx. (Area)(-2) at constant current. Author

N83-22071# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
SUBMILLIMETRE RECIEVER WITH LASER LOCAL OSCILLATORS **c36**
G. V. Schultz, E. J. Durwen, H. P. Roeser, and R. Wattenbach *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 213-216 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A heterodyne detection system for the submm wavelength using a laser as local oscillator and an open structure mixer is described. At Jungfraujoch the system had a noise temperature of 4300 K (DSB) and was used for astronomical observations of objects with continuum spectra in a bandwidth of 80 MHz and for narrow lines using a 1024 channel acousto-optical spectrometer with a resolution of 200 kHz per channel. The first results are presented. Author

N83-22072# Royal Observatory, Edinburgh (Scotland).
THE SCIENTIFIC SIGNIFICANCE OF SUBMILLIMETRE ASTRONOMY **c89**
M. S. Longair *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

A review is given of the scientific significance of submillimetre observations for a wide range of astrophysical problems. The papers presented at the workshop are reviewed in the context of the major research areas which can be addressed by these types of observation. It is shown how these range through essentially the whole of modern astrophysics. Various thoughts about the way in which the subject will develop and how the new facilities will be run are presented. Author

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N83-22073*# Pennsylvania State Univ., University Park. Dept. of Astronomy.
SUPPORT OF RESEARCH IN X-RAY ASTRONOMY Final Technical Report
Gordon Garmire 18 Feb. 1983 104 p refs
(Grant NAGw-108)
(NASA-CR-170128; NAS 1.26:170128) Avail: NTIS HC A06/MF A01 CSCL 03A

Activities described include: (1) the evaluation of CCD detectors for X-ray astronomy applications; (2) contributions to the development of an imaging gas scintillation proportional counter; (3) the evaluation of certain metal oxide crystals as potential radiation detectors; (4) optical observations and searches for X-ray sources discovered by the HEAO-1 A2 experiment; and (5) theoretical modeling of nonequilibrium ionization structure of supernova remnants. A.R.H.

N83-22074*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN X-RAY SURVEY OF 9 ALGOL SYSTEMS
N. E. White (ESTEC, Noordwijk, Netherlands) and F. E. Marshall Feb. 1983 16 p refs Submitted for publication
(NASA-TM-84992; NAS 1.15:84992; Rept-661) Avail: NTIS HC A02/MF A01 CSCL 03A

The observed X-ray luminosities seen from an Einstein survey of nine Algol like systems are similar to those found by Pallavicini, et al. (1981) for single or widely separated rapidly rotating late stars, but fall an order of magnitude below those seen from RS CVn stars with similar orbital periods and spectral types. It is concluded that the X-ray emission is most probably associated with a hot coronae surrounding the secondary. Possible explanations for the lower luminosity of the Algol systems relative to the RS CVn systems are considered. M.G.

N83-22035# Queen Mary Coll., London (England). Dept. of Physics.
RECENT SUBMILLIMETRE WAVELENGTH STUDIES OF MOLECULES IN STAR FORMATION REGIONS
G. J. White *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 5-11 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22038# Mullard Radio Astronomy Observatory, Cambridge (England).
SUBMILLIMETRE SPECTRAL LINE OBSERVATIONS AND CONDENSATIONS IN MOLECULAR CLOUDS
R. Padman *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 29-30 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22042*# California Inst. of Tech., Pasadena.
SUBMILLIMETRE OBSERVATIONS OF ATOMIC CARBON
T. G. Phillips and Jocelyn Keene *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 45-49 refs (For primary document see N83-22034 11-88)
(Grant NAG2-1)
Avail: NTIS HC A11/MF A01 CSCL 03A

N83-22043# Mullard Radio Astronomy Observatory, Cambridge (England).
STATUS REPORT ON THE UK-NL 15-METRE TELESCOPE
R. Hills *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 51-52 (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22044# Cologne Univ. (West Germany). Physikalisches Inst.
THE COLOGNE 3-M MILLIMETRE AND SUBMILLIMETRE RADIO TELESCOPE
G. Winnewisser, M. Bester, E. Pofahl, M. Olberg, G. Rau, W. Zensen, P. Wratil, and B. Vowinkel *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 53-57 refs Sponsored by Deutsche Forschungsmeinschaft (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22045# Grenoble Univ. (France). Groupe d'Astrophysique du CNRS.
PROJECTED INSTALLATION OF A 2.5m ANTENNA ON THE PLATEAU DE BURE FOR 1.3m OBSERVATIONS
R. Lucas *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 59-60 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22046# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
A 10m TELESCOPE FOR SUBMILLIMETRE ASTRONOMY
J. W. M. Baars and P. C. Mezger *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 61-62 refs Sponsored by Max-Planck Society, Alfred Krupp van Bohlen und Halbach Foundation and Ariz. Univ. (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22048*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
PROGRESS IN AIRBORNE INFRARED AND SUBMILLIMETRE SPECTROSCOPY
M. Harwit *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 65-67 refs (For primary document see N83-22034 11-88)
(Grants NsG-2347; NGR-33-010-146)
Avail: NTIS HC A11/MF A01 CSCL 03A

N83-22049# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Wesseling (West Germany). Space Research Group.
ASTROPLANE: A EUROPEAN RESEARCH AIRCRAFT FOR IR AND SUBMILLIMETRE ASTRONOMY (THE DFVLR PROPOSAL)
C. B. Cosmovici, E. Schmidt, and U. Stanggassinger *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 69-79 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22050# European Space Research and Technology Center, Noordwijk (Netherlands). Astronomy Div.
INFRARED SPACE OBSERVATORY (ISO): AN ESA STUDY OF A CRYOGENICALLY-COOLED TELESCOPE IN SPACE FOR INFRARED ASTRONOMY
R. Emery *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 81-87 refs Previously announced in IAA as A83-17429 (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22051*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SUBMILLIMETRE ASTRONOMY FROM SPACE PLATFORMS
T. B. H. Kuiper and D. J. Hollenbach (NASA. Ames Research Center) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 ap 91-96 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01 CSCL 03A

N83-22052# European Space Research and Technology Center, Noordwijk (Netherlands). Astronomy Div.
HETERODYNE INSTRUMENTATION FOR SPACE
T. deGraaw *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 97-98 (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22053`# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A CONCEPT FOR AN ORBITING SUBMILLIMETRE-INFRARED OBSERVATORY
P. N. Swanson and M. Kiya (NASA. Ames Research Center) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 99-105 refs (For primary document see N83-22034 11-88)
(Contract NAS7-100)
Avail: NTIS HC A11/MF A01 CSCL 03A

N83-22059# Stockholm Univ. (Sweden).
OBSERVATIONS OF THE J=3-2 AND 1-0 TRANSITIONS OF HCO+ IN NGC2071 CEP MC-1 AND W3
A. Sandqvist, R. B. Loren (Millimetre wave Obs., Fort Davis, Tex.), A. Wootten (Rensselaer Polytech. Inst.), P. Friberg (Onsala Space Observatory, Sweden), and A. Hjalmarson (Onsala Space Observatory, Sweden) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 131-134 refs Sponsored by Swedish Natural Science Research Council, Swedish Board for Technical Development (For primary document see N83-22034 11-88)
(Grants NSF AST-79-16815; NSF AST-79-20966)
Avail: NTIS HC A11/MF A01

N83-22061# Preston Polytechnic (England). Div. of Physics and Astronomy.
CONTINUUM OBSERVATIONS OF EXTRAGALACTIC SOURCES
E. I. Robson *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 147-455 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22063# Observatoire de Paris-Meudon (France).
OBSERVATION OF GIANT PLANETS AND COMETS IN THE FAR INFRARED AND SUBMILLIMETERIC RANGE
T. Encrenaz, M. Combes, and J. Crovisier *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 167-173 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22072# Royal Observatory, Edinburgh (Scotland).
THE SCIENTIFIC SIGNIFICANCE OF SUBMILLIMETRE ASTRONOMY
M. S. Longair *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N83-22075 Academy of Sciences (USSR), Moscow. Space Research Inst.
MXB 1730-335, A BURSTING LONG PERIODIC PULSAR?
V. M. Loznikov and N. S. Yamburenko 1982 12 p refs
(PR-734) Copyright. Avail: SOD

The presence of some modes (temporary stable states) of the burst activity of the rapid burster (MXB1730-355) by variations of the geometry of the accretion onto a slowly rotating neutron star with a low magnetic field is qualitatively explained. Mode 1 may correspond to the accretion onto one magnetic polar cap, and mode 2 onto both magnetic caps. An assumption is made that mode 3 might be the result of disc accretion onto the equatorial region of the neutron star. Author

N83-22076 Academy of Sciences (USSR), Moscow. Space Research Inst.
GENERATION OF THE PRIMORDIAL PERTURBATIONS IN THE EARLY UNIVERSE
V. N. Lukash and I. D. Novikov 1982 28 p refs
(PR-735) Copyright. Avail: SOD

The problem of origin of the primordial cosmological perturbations in the early Universe which led to the formation of a large-scale structure of the observed world is considered. A theory of formation of these perturbations is proposed, with the effect of spontaneous phonon (sound wave) creation in the process of the cosmological expansion as a basis. A spectrum of primordial sound waves due to vacuum phase transitions is derived. Author

N83-22077 Academy of Sciences (USSR), Moscow. Space Research Inst.
SEARCH FOR THE PERIODICITY IN GAMMA-BURSTS
V. M. Loznikov and A. V. Kuznetsov 1982 28 p refs
(PR-743) Copyright. Avail: Issuing Activity

Six gamma-bursts with the measured denisty of the energy flux in the burst from 1.0 X 10 to the -6th power erg/sq cm to

3.2 X 10 to the -4 power erg/sq cm and three solar flares were analyzed by the method of the periodogramm-analysis within periods 0.1 s+4.0s. In contrast to solar flares the existence of the set of periods preserving during the whole information analyzed was shown. The multiperiodicity phenomenon cannot be explained by models associated with the rotation or oscillations of neutron stars or white dwarfs. Author

N83-22078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE EVOLUTION OF STRUCTURE IN THE UNIVERSE FROM AXIONS
F. W. Stecker and Q. Shafi Dec. 1982 13 p refs Submitted for publication
(NASA-TM-84963; NAS 1.15:84963; Rept-660) Avail: NTIS HC A02/MF A01 CSCL 03B

A scenario where axions provide the dark matter in the universe is considered. Fluctuations in the axion field density produced by domain walls and strings cause the appearance of 'axion clumps' of masses of order 10 to the 6th power solar mass which most likely collapse to black holes by or at the time that the universe becomes axion dominated at T is approximately 10 eV. These objects form the building blocks for a clustering hierarchy theory of galaxy and supercluster formation on scales up to approximately 10 Mpc and approximately 10 to the 15th power solar mass. M.G.

N83-22079# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
MASS LOSS FROM EARLY-TYPE STARS
Peter S. Conti [1982] 14 p refs
Avail: NTIS HC A02/MF A01

Stellar winds are observed in hot and luminous stars of all types. The evidence for the winds comes from observations of P Cygni profiles of resonance lines of highly ionized common species, from emission lines of highly excited ions, and from free-free radiation from the electrons in the outflowing material. Stellar winds have as their dominant origin the radiation pressure in the ultraviolet lines coupling momentum to the wind as a whole. It was found that for the most luminous OB stars, in which the winds can readily be detected, the mass loss rate is proportional to the luminosity, L, to a power alpha, where alpha is of the order of 1.7. This relation carries over four orders of magnitude in the mass loss rates. This relation also continues to the lower luminosity giant and main sequence B type stars. By contrast, the mass loss rates for the enigmatic Wolf-Rayet (W-R) stars, which have among themselves vastly different spectra, luminosities, and masses are similar. B.G.

N83-22036# Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.
THE ROTATIONAL POPULATIONS AND ABUNDANCES OF INTERSTELLAR C2 AND C2H
J. H. Black and E. F. vanDishoeck (Sterrewacht, Leiden) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 13-20 refs Sponsored by Netherlands Organization for the Advancement of Pure Research (For primary document see N83-22034 11-88)
(Grant NSF AST-81-14718)
Avail: NTIS HC A11/MF A01

N83-22037# Cologne Univ. (West Germany). Physikalisches Inst.
INTERSTELLAR HYBRIDES
G. Winnewisser, M. R. Aliev, and K. Yamada *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 23-28 refs Sponsored by Deutsche Forschungsmeinschaft (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22039# Turin Univ. (Italy). Ist. di Fisica Generale.
HIGH-EXCITATION ROTATIONAL MOLECULAR LINES FROM DENSE INTERSTELLAR CLOUDS
G. Silvestro and A. Ferrari *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 31-32 refs Prepared in cooperation with CNR, Turin (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22041# Massachusetts Univ., Amherst. Five College Radio Astronomy Obs.
HIGH-VELOCITY EMISSION IN THE ORION MOLECULAR CLOUD
P. F. Goldsmith *In* ESA The Sci. Importance of Submillimeter Observations Aug. 1982 p 37-41 refs Sponsored by the Commonwealth of Massachusetts (For primary document see N83-22034 11-88)
(Grant NSF AST-81-21481)
Avail: NTIS HC A11/MF A01

N83-22054# Texas Univ., Austin. Dept. of Astronomy.
CLOUD MODELING WITH MILLIMETRE TRANSITIONS: IMPLICATIONS FOR SUBMILLIMETRE OBSERVATIONS
P. A. VandenBout *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 109-113 refs (For primary document see N83-22034 11-88)
(Grant NSF AST-81-16403)
Avail: NTIS HC A11/MF A01

N83-22055# Amsterdam Univ. (Netherlands). Inst. of Astronomy.
PREDICTIONS OF LINE INTENSITIES FROM HYDROSTATIC MODELS OF MOLECULAR CLOUDS
W. Boland *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 115-117 refs Sponsored by Netherlands Foundation for Astronomical Research and Netherlands Organization for Advancement of Pure Research. (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22056# Max-Planck-Institut fuer Radioastronomie, Bonn (West Germany).
DETAILED MODELS OF MOLECULAR CLOUDS WITH AND WITHOUT MASSIVE STAR FORMATION
L. G. Stenholm *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 119-122 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22057# Ecole Normale Superieure, Paris (France). Lab. de Physique.
DYNAMICAL STRUCTURE OF REGIONS OF INTERMEDIATE-MASS STAR FORMATION
F. Falgarone, J. L. Puget, and M. Perault *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 123-128 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22058*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Systems Div.
WATER AS A PROBE OF STAR-FORMING REGIONS
E. N. Rodriguez-Kuiper (Bell Aerospace Systems Div., Huntington Beach, Calif.) and T. B. H. Kuiper *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 129-130 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

N83-22060# Manchester Univ. (England). Inst. of Science and Technology.
A TIME-DEPENDENT MODEL FOR THE CHEMICAL COMPOSITION OF INTERSTELLAR MOLECULAR CLOUDS
G. D. Watt and D. A. Williams *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 135-140 refs Sponsored by SRC (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N83-22080 Academy of Sciences (USSR), Moscow. Space Research Inst.
MODEL OF HALLEY'S COMET AS AN OPTICAL TARGET
V. I. Moroz 1982 43 p refs
(PR-736) Copyright. Avail: Issuing Activity

The joint analysis of data on integral stellar magnitude of comet Halley and theoretical distributions of brightness showed that the coma will be obviously optically thin up to the nucleus boundaries. It is expected that the nucleus of Halley's comet will be accessible to imaging with a TV camera. A set of photometric models of comets is given useful for a choice of characteristics of TV and pointing systems for imaging of the comet central region from a cometary probe. Author

N83-22081*# National Aeronautics and Space Administration, Washington, D. C.
THE STUDY OF VENUS CONTINUES
V. L. Barsukov Feb. 1983 16 p refs Transl. into ENGLISH from Priroda (USSR), no. 12, Dec. 1982 p 10-17 Previously announced in IAA as A83-19415 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77198; NAS 1.15:77198) Avail: NTIS HC A02/MF A01 CSCL 03B

The landing of the Soviet interplanetary station Venera-13 in March, 1982, is described. One of the tasks of the station was to study the composition and structure of cloud layers on Venus. It was established that the cloud layer consists largely of sulfuric acid. Data obtained from other Venera stations are also presented. It is concluded that fundamental similarities can be found in the geological development of the Earth and Venus. Author

N83-22082*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE STUDY OF THE PHYSICS OF COMETARY NUCLEI Semiannual Progress Report, 1 Oct. 1982 - 31 Mar. 1983
Fred L. Whipple Mar. 1983 17 p refs
(Grant NsG-7082)
(NASA-CR-170114; NAS 1.26:170114; SAPR-17) Avail: NTIS HC A02/MF A01 CSCL 03B

On the basis of the icy conglometate model of cometary nuclei various observations demonstrate the spotted nature of many or most nuclei, i.e., regions of unusual activity, either high or low. Rotation periods, spin axes and even precession of the axes have been determined. Narrow dust jets near the nuclei of some bright comets require that small sources be embedded in larger active areas. Certain evidence suggests that very dusty areas and very dusty comets may be less active, respectively, than surrounding areas or other comets. Author

N83-22083 Academy of Sciences (USSR), Moscow. Space Research Inst.
SPECTROPHOTOMETRICAL EXPERIMENT ON THE VENERA-13 AND VENERA-14 LANDERS
V. I. Moroz, B. E. Moshkin, A. P. Ekonomov, Yu. M. Golovin, V. I. Gnedykh, and A. V. Grigorjev 1982 20 p refs
(PR-746) Copyright. Avail: SOD

Spectra of solar radiation in the range 0.45 < lambda < 1.2 mkm scattered in the deep layers of the Venusian atmosphere were registered by spectrophotometers of Venera-13 and Venera-14 at 6 different angles at all the heights between 62 km and the surface. The water vapor abundance was estimated from the intensity of H2O bands between 0.7 mkm and 1 mkm. Water abundance near the surface is about 10/20 ppm and by the order of magnitude more at a height of about 40 km. The water profile with the maximum of mixing ratio between 40 km and 60 km can be in approximate agreement with all the water measurements provided on board Venera-13 and Venera-14 by three different methods. Ultraviolet intensity at lambda = 0.37 mkm with some filter device was also measured. Ninety percent of the solar radiation in this range is absorbed in the clouds above the level of 58 km. Author

N83-22084*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FLUX AND SOURCE OF ENERGETIC PROTONS IN SATURN'S INNER MAGNETOSPHERE
A. W. Schardt and F. B. McDonald Dec. 1982 59 p refs
(NASA-TM-84938; NAS 1.15:84938) Avail: NTIS HC A04/MF A01 CSCL 03B

The flux of energetic protons in Saturn's inner magnetosphere was observed in two channels from 48 to 63 and 63 to 160 MeV. Absorption features due to the G ring and the satellites Enceladus and Mimas were easily identifiable. The flux observed in the absorption slot of Mimas can be maintained by the decay of a cosmic ray albedo neutron flux of 0.007/sq cm/s/sr. This flux is entirely consistent with calculations of the neutron flux produced by galactic cosmic ray interactions with the rings of Saturn. The omnidirectional proton flux of 0.0082/sq cm/s at 2.734 R sub s requires a residence time of 30 years. Both the residence time and the energy spectrum are comparable to those found in the inner radiation belt of the Earth. The angular distribution is nearly isotropic in the Mimas slot and beyond 4R sub s. Otherwise the pitch angle distribution is pancake and is approximated by sin(n)theta with n in the range 2 to 7. This distribution is consistent with an isotropic neutron source in the ring plane. M.G.

N83-22085*# National Aeronautics and Space Administration, Washington, D. C.
PLANETARY EXPLORATION THROUGH YEAR 2000: A CORE PROGRAM, PART 1
1983 29 p Original contains color illustrations
(NASA-TM-85288; NAS 1.15:85288) Avail: NTIS HC A03/MF A01 CSCL 03B

The Core Program, goals for planetary exploration, continuity and expansion, core program missions, mission implementation, anticipated accomplishments, resource requirements, and near term budget decisions are discussed. Author

N83-22086*# Martin Marietta Corp., Denver, Colo. Payloads, Sensors and Instruments Dept.
COMET COMPOSITION AND DENSITY ANALYZER Final Report
Benton C. Clark Nov. 1982 116 p
(Contract NASw-3108)
(NASA-CR-170159; NAS 1.26:170159; MCR-82-626) Avail: NTIS HC A06/MF A01 CSCL 03B

Distinctions between cometary material and other extraterrestrial materials (meteorite suites and stratospherically-captured cosmic dust) are addressed. The technique of X-ray fluorescence (XRF) for analysis of elemental composition is involved. Concomitant with these investigations, the problem of collecting representative samples of comet dust (for rendezvous missions) was solved, and several related techniques such as mineralogic analysis (X-ray diffraction), direct analysis of the nucleus without docking (electron macroprobe), dust flux rate measurement, and test sample preparation were evaluated. An explicit experiment concept based upon X-ray fluorescence analysis of biased and unbiased sample collections was scoped and proposed for a future rendezvous mission with a short-period comet. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N83-22087*# Colorado Univ., Boulder. Dept. of Astro-Geophysics.

THE MEASUREMENT OF SOLAR SPECTRAL IRRADIANCES AT WAVELENGTHS BETWEEN 40 AND 4000 A Final Report
J. G. Timothy Mar. 1983 34 p refs
(Grant NsG-7559)
(NASA-CR-170126; NAS 1.26:170126) . Avail: NTIS HC A03/MF A01 CSCL 03B

Two 1/8-meter Ebert-Fastie spectrometers were refurbished and upgraded in order to measure the solar spectral irradiances between 1160 A and 3100 A. An evacuated 1/4-meter normal-incidence spectrometer was also fabricated for spectral irradiance measurements over the wavelength range from 1250 A to 250 A. Procedures were developed for the calibration of all three instruments utilizing standards at the National Bureau of Standards. The two 1/8-meter spectrometers were flown to measure the solar spectral irradiances near solar maximum on two different dates. Data from these flights were analyzed. The performance of the spectrometers, and the results of an analysis of the variabilities of the solar spectral irradiances over the solar cycles 20 and 21 are discussed. A.R.H.

N83-22064# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Dept. of Physics.
SUBMILLIMETRE-WAVE BRIGHTNESS TEMPERATURES OF SOLAR ACTIVE ZONES AND SUNSPOTS MEASURED FROM A BALLOON-BORNE PLATFORM
F. Carrier, F. K. Kneubuenl, D. Huguenin (Geneva Observatory), and E. A. Mueller (Geneva Observatory) *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 175-179 refs Sponsored by Swiss Natural Science Foundation and Geneva Obs. (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N83-22088*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACTIVE GALAXIES AND THE DIFFUSE GAMMA-RAY BACKGROUND
D. Kazanas and R. J. Protheroe 15 Feb. 1983 14 p refs
(NASA-TM-84974; NAS 1.15:84974; Rept-665) Avail: NTIS HC A02/MF A01 CSCL 03B

A model for the origin of relativistic particles and gamma rays in active galactic nuclei and quasars, together with recent HEAO-1 observations of the spectra of active galaxies from 2 to 165 keV, provide the basis for a reexamination of the nature of the extragalactic gamma ray background. Active galaxies account for the observed background if their X-ray spectra steepen to E.021 above 100 keV, as observed in Cen-A, together with a further steepening to E.021 as a result of absorption of gamma rays by photon-photon pair production interactions with X-ray photons. The compactness of active galaxies required to give this steepening is consistent with estimates of their typical luminosity and radius.
S.L.

N83-22040# European Space Research and Technology Center, Noordwijk (Netherlands). Space Science Dept.
THE SO 2 SUB 3 - 1 SUB 2 EMISSION IN ORION A
J. P. Phillips and G. J. Whije (Queen Mary Coll.) *In* ESA The Sci. Importance of Submillimeter Observations Aug. 1982 p 33-36 refs (For prin.ary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

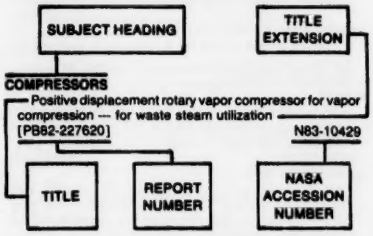
N83-22062# Ecole Normale Superieure, Paris (France). Lab. de Physique.
SUBMILLIMETRE CONTINUUM EMISSION OF THE GALAXY
J. L. Puget *In* ESA The Sci. Importance of Submillimetre Observations Aug. 1982 p 157-166 refs (For primary document see N83-22034 11-88)
Avail: NTIS HC A11/MF A01

99 GENERAL

N83-22089# Rome Air Development Center, Griffiss AFB, N.Y.
RADC TECHNICAL OBJECTIVE DOCUMENT (TOD) C(3)I, FISCAL YEAR 1984
Carlo P. Crocetti Dec. 1982 61 p
(AD-A122765; RADC-TR-82-267; RADC-TOD-82-11) Avail: NTIS HC A04/MF A01 CSCL 17/2

This TOD describes the technical programs of the Rome Air Development Center in support of the Air Force Command, Control, Communications and Intelligence (C3I) mission. The technical objectives have been aligned with the VANGUARD mission areas of Command, Control, and Communications (C3), Reconnaissance and Intelligence, Strategic Systems (Defense), and Technology as a means of focusing the RADC support of VANGUARD.
Author (GRA)

Typical Subject Index Listing



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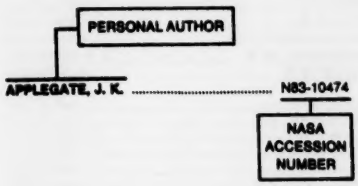

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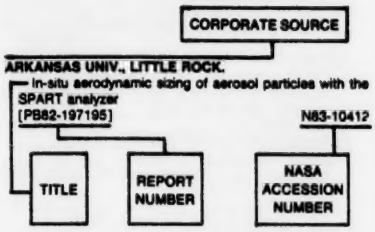

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ACADEMIA SINICA, NANKANG, TAIPEI (TAIWAN).
An operator approach to the strong coupling transmutation of a Yukawa interaction
[DE82-013895] N83-21924

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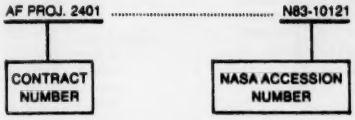

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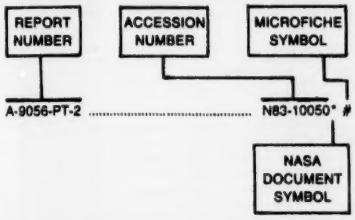

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